[COMMITTEE PRINT]

ASTRONAUTS AND COSMONAUTS BIOGRAPHICAL AND STATISTICAL DATA

[Revised—June 28, 1985]

REPORT

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LETTER OF SUBMITTAL

CONGRESSIONAL RESEARCH SERVICE,
THE LIBRARY OF CONGRESS,
Washington, DC, August 26, 1985.

. BILL NELSON,
irman, Committee on Science and Technology, Subcommittee on
Space Science and Applications, House of Representatives,
Washington, DC.

EAR MR. CHAIRMAN: Pursuant to your request, we are hereby
smitting an updated version of "Astronauts and Cosmonauts:
raphical and Statistical Data." This edition contains informa-
current through June 28, 1985.

sic data on United States astronauts and payload specialists as
as European participants in the U.S. program were obtained
ugh NASA, particularly from Norma Kersman and Lucy
vynsky of Johnson Space Center. We greatly appreciate their
stance. The principal source of information on the cosmonauts
participants in the Soviet program has been TASS announce-
ts as reported by the Foreign Broadcast Information Service.
siderable detailed information was assembled from numerous
rmal sources in the space community, including Mr. Rex Hall
Mr. Geoffrey Perry, M.B.E., in England, and Mr. Theo Pirard
elgium.

s has been done in the past, every effort was made to update
rmation on all present and former astronauts from NASA, the
5, X-20, Dyna-Soar, and Manned Orbiting Laboratory programs
ne United States, cosmonauts in the Soviet Union, and space-
s from other countries. Despite this effort, a few records may
itably be out of date, especially those for the cosmonauts and
et-bloc participants since this information is so difficult to
in. Unfortunately, some photographs could not be reproduced
er because they were not available, or copyright permission
d not be secured.

ne report was updated by Patricia E. Humphlett, Analyst in
ospace and Telecommunications Systems of the Science Policy
earch Division, based on previous additions and statistical data
ided by Marcia S. Smith.

Sincerely,

GILBERT GUDE,
Director.

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CHAPTER ONE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ASTRONAUTS

Since April 1959, 144 astronauts have been chosen by the National Aeronautics and Space Administration (NASA). As of June 28, 1985, there are 89 on active status, 46 resigned, and 9 deceased. An additional 13 astronaut candidates were selected on June 14, 1985, who are going through a one-year training program before they will qualify as astronauts.

The astronauts are chosen in groups, and to date NASA has selected 11 groups: Group I, April 9, 1959, 7 chosen; Group II, September 17, 1962, 9 chosen; Group III, October 18, 1963, 14 chosen; Group IV, June 28, 1965, 6 chosen; Group V, April 4, 1966, 19 chosen; Group VI, August 4, 1967, 11 chosen; Group VII, August 14, 1969, 7 transfers from the Department of Defense Manned Orbiting Laboratory program (see chapter three); Group VIII, January 16, 1978, 35 chosen; Group IX, May 29, 1980, 19 chosen, Group X, May 23, 1984, 17 chosen; and Group XI, June 4, 1985, 13 chosen.

In addition to the astronauts described here, NASA has selected people to serve as payload specialists on future space shuttle flights. These individuals are included in chapter 2. The European Space Agency and other countries have also selected payload specialists, and these are discussed in chapter 5.

During the Mercury, Gemini, Apollo, Skylab, Apollo-Soyuz and Shuttle programs, 101 of the astronauts have made space flights, accumulating a total of 36,270 hours and 32 minutes in space. In addition, 38 astronauts accumulated 189 hours and 42 minutes of EVA (extravehicular activity) time in space, as well as 162 hours and 13 minutes of EVA time on the lunar surface. Of the 89 astronauts remaining in the corps, 40 have yet to make their first space flight: 2 from Group VI, 2 from Group VIII, all 19 from Group IX, and all 17 from Group X. The Group XI astronaut candidates will not be eligible for shuttle mission assignment until June 1986.

TABLE 1-1

STATUS OF ASTRONAUTS BY GROUP

Name	Year of First Flight**	Current Status
GROUP I - 1959 (Mercury Pilots)		
Carpenter	1962	Resigned
Cooper	1963	Resigned
Glenn	1962	Resigned
Grissom	1961	Deceased (Apollo 204)
Schirra	1962	Resigned
Shepard	1961	Resigned
Slayton	1975	Resigned
GROUP II - 1962 (pilot-astronauts)		
Armstrong	1966	Resigned
Borman	1965	Resigned
Conrad	1965	Resigned
Lovell	1965	Resigned
McDivitt	1965	Resigned
See	none	Deceased (T-38 crash)
Stafford	1965	Resigned
White	1965	Deceased (Apollo 204)
Young	1965	Active
GROUP III - 1963 (pilot-astronauts)		
Aldrin	1966	Resigned
Anders	1968	Resigned
Bassett	none	Deceased (T-38 crash)
Bean	1969	Resigned
Cernan	1966	Resigned
Chaffee	none	Deceased (Apollo 204)
Collins	1966	Resigned
Cunningham	1968	Resigned
Eisele	1968	Resigned
Freeman	none	Deceased (T-38 crash)
Gordon	1966	Resigned
Schweickart	1969	Resigned
Scott	1966	Resigned
Williams	none	Deceased (T-38 crash)
GROUP IV - 1965 (scientist-astronauts)		
Garriott	1973	Active
Gibson, Edward	1973	Resigned
Graveline	none	Resigned
Kerwin	1973	Active
Michel	none	Resigned
Schmitt	1972	Resigned

TABLE I-1 (cont.)

Name	Year of First Flight**	Current Status
GROUP V - 1966 (pilot-astronauts)		
Brand	1975	Active
Bull	none	Resigned
Carr	1973	Resigned
Duke	1972	Resigned
Engle	1981	Active
Evans	1972	Resigned
Givens	none	Deceased (auto accident)
Haise	1970	Resigned
Irwin	1971	Resigned
Lind	1985	Active
Lousma	1973	Resigned
Mattingly	1972	Resigned
McCandless	1984	Active
Mitchell	1971	Resigned
Pogue	1973	Resigned
Roosa	1971	Resigned
Swigert	1970	Deceased
Weitz	1973	Active
Worden	1971	Resigned
GROUP VI - 1967 (scientist-astronauts)		
Allen	1982	Active
Chapman	none	Resigned
England	pending [1985]	Active
Henize	pending [1985]	Active
Holmquest	none	Resigned
Lenoir	1982	Resigned
Llewellyn	none	Resigned
Musgrave	1983	Active
O'Leary	none	Resigned
Parker	1983	Active
Thornton	1983	Active
GROUP VII - 1969 (ex-MOL astronauts)		
Bobko	1983	Active
Crippen	1981	Active
Fullerton	1982	Active
Hartsfield	1982	Active
Overmyer	1982	Active
Peterson	1983	Resigned
Truly	1981	Resigned

TABLE 1-1 (cont.)

Name	Year of First Flight	Current Status
GROUP VIII - 1978 (pilots and mission specialists)		
Bluford	1983	Active
Brandenstein*	1983	Active
Buchli	1985	Active
Coats*	1984	Active
Covey*	pending [1985]	Active
Creighton*	1985	Active
Fabian	1983	Active
Fisher, Anna	1984	Active
Gardner, Dale	1984	Active
Gibson, Robert*	1984	Active
Gregory*	1985	Active
Griggs*	1985	Active
Hart	1984	Resigned
Hauck*	1984	Active
Hawley	1984	Active
Hoffman	1985	Active
Lucid	1985	Active
McBride*	1984	Active
McNair	1984	Active
Mullane	1984	Active
Nagel*	1985	Active
Nelson	1984	Active
Onizuka	1985	Active
Resnik	1984	Active
Ride	1984	Active
Scobee*	1985	Active
Seddon	1985	Active
Shaw*	1983	Active
Shriver*	1985	Active
Stewart	1984	Active
Sullivan	1984	Active
Thagard	1983	Active
van Hoften	1984	Active
Walker*	1984	Active
Williams*	1984	Active
GROUP IX - 1980 (pilots and mission specialists)		
Bagian	pending	Active
Blaha*	pending [1986]	Active
Bolden*	pending [1985]	Active
Bridges*	pending [1985]	Active
Chang	pending [1985]	Active
Cleave	pending [1985]	Active
Dunbar	pending [1985]	Active
Fisher, William	pending [1985]	Active

TABLE 1-1 (cont.)

Name	Year of First Flight	Current Status
Gardner, Guy*	pending [1986]	Active
Grabe*	pending [1985]	Active
Hilmers	pending [1985]	Active
Leestma	pending [1986]	Active
Lounge	pending [1985]	Active
O'Connor*	pending [1985]	Active
Richards*	pending [1986]	Active
Ross	pending [1985]	Active
Smith*	pending [1986]	Active
Spring	pending [1985]	Active
Springer	pending [1986]	Active
GROUP X - 1984 (pilots and mission specialists)		
Adamson	pending	Active
Brown	pending	Active
Cameron*	pending	Active
Carter	pending	Active
Casper*	pending	Active
Culbertson*	pending	Active
Gutierrez*	pending	Active
Hammond*	pending	Active
Ivins	pending	Active
Lee	pending	Active
Low	pending	Active
McCulley*	pending	Active
Sheperd	pending	Active
Shulman	pending	Active
Thornton, K.	pending	Active
Veach	pending	Active
Wetherbee*	pending	Active

* Pilot astronaut. (All others are mission specialists.)

**Astronauts who have been assigned to missions which have not yet flown are shown with the date in brackets. Actual launch date may vary.

TABLE 1-2
ASTRONAUT CUMULATIVE SPACE AND EVA TIMES

Astronaut	Number of Flights	Total Time in Space (hr:min)	EVA (hr:min) Space	EVA (hr:min) Lunar	EVA (hr:min) Total
Aldrin	2	289:54	5:30	2:48	8:18
Allen	2	313:59	10:43	none	10:43
Anders	1	147:01	none	none	none
Armstrong	2	206:00	none	2:48	2:48
Bean	2	1671:45	2:41	7:46	10:27
Bluford	1	145:09	none	none	none
Bobko	2	288:20	none	none	none
Borman	2	477:36	none	none	none
Brand	3	530:58	none	none	none
Brandenstein	2	314:48	none	none	none
Buchli	1	73:33	none	none	none
Carpenter	1	04:56	none	none	none
Carr	1	2017:16	15:51	none	15:51
Cernan	3	566:16	2:07	22:04	24:11
Coats	1	144:57	none	none	none
Collins	2	266:06	1:27	none	1:27
Conrad	4	1179:38	4:59	7:46	12:45
Cooper	2	225:15	none	none	none
Creighton	1	169:39	none	none	none
Crippen	4	565:49	none	none	none
Cunningham	1	260:09	none	none	none
Duke	1	265:51	1:24	20:14	21:38
Eisele	1	260:09	none	none	none
Engle	1	54:13	none	none	none
Evans	1	301:52	1:06	none	1:06
Fabian	2	316:03	none	none	none
Fisher, A.	1	191:45	none	none	none
Fullerton	1	192:05	none	none	none
Gardner, D.	2	336:54	10:43	none	10:43
Garriott	2	1674:56	13:42	none	13:42
Gibson, E.	1	2017:16	15:22	none	15:22
Gibson, R.	1	191:16	none	none	none
Glenn	1	04:55	none	none	none
Gordon	2	315:53	2:41	none	2:41
Gregory	1	168:03	none	none	none
Griggs	1	167:56	3:00	none	3:00
Grissom	2	05:09	none	none	none
Haise	1	142:55	none	none	none
Hart	1	167:40	none	none	none
Hartsfield	2	314:07	none	none	none
Hauck	2	337:09	none	none	none
Hawley	1	147:57	none	none	none
Hoffman	1	167:56	3:00	none	3:00
Irwin	1	295:12	0:38	18:35	19:13
Kerwin	1	672:50	3:23	none	3:23
Leestma	1	197:24	3:30	none	3:30
Lenoir	1	122:14	none	none	none

TABLE 1-2 (cont.)

	Lind	1	168:03	none	none	none
	Lousma	2	1619:14	11:01	none	11:01
	Lovell	4	715:06	none	none	none
	Lucid	1	169:39	none	none	none
	Mattingly	3	508:34	1:24	none	1:24
	McBride	1	197:24	none	none	none
	McCandless	1	191:16	none	none	none
	McDivitt	2	338:57	none	none	none
	McNair	1	191:16	11:30	none	11:30
	Mitchell	1	216:02	none	9:23	9:23
	Mullane	1	144:57	none	none	none
	Musgrave	1	120:24	3:52	none	3:52
	Nagel	1	169:39	none	none	none
	Nelson	1	167:40	10:30	none	10:30
	Onizuka	1	73:33	none	none	none
	Overmyer	2	290:17	none	none	none
	Parker	1	247:47	none	none	none
	Peterson	1	120:24	3:52	none	3:52
	Pogue	1	2017:16	13:37	none	13:37
	Resnik	1	144:57	none	none	none
	Ride	2	343:48	none	none	none
	Roosa	1	216:02	none	none	none
	Schirra	3	295:13	none	none	none
	Schmitt	1	301:52	1:06	22:04	23:10
	Schweickart	1	241:01	1:07	none	1:07
	Scobee	1	167:40	none	none	none
	Scott	3	546:54	1:01	19:08	20:09
	Seddon	1	167:56	none	none	none
	Shaw	1	247:47	none	none	none
	Shepard	2	216:17	none	9:23	9:23
	Shriver	1	73:33	none	none	none
	Slayton	1	217:28	none	none	none
	Stafford	4	507:43	none	none	none
	Stewart	1	191:16	11:30	none	11:30
	Sullivan	1	197:24	3:30	none	3:30
	Swigert	1	142:55	none	none	none
	Thagard	2	314:27	none	none	none
	Thornton, W.	2	313:12	none	none	none
	Truly	2	199:22	none	none	none
	van Hoften	1	167:40	10:30	none	10:30
	Walker	1	191:45	none	none	none
	Weitz	2	793:14	2:11	none	2:11
	White	1	97:56	0:36	none	0:36
	Williams	1	167:56	none	none	none
	Worden	1	295:12	0:38	none	0:38
	Young	6	835:42	none	20:14	20:14
TOTAL	101 Astronauts	49	36,270:32	189:42	162:13	351:55

EVA (extravehicular activity) time was measured differently for different space programs. During Gemini, EVA was computed from hatch opening to hatch closing. During Apollo and Skylab, it was taken from the time cabin pressure reached 3.0 psi during depressurization and repressurization.

A. SELECTION CRITERIA

1. EDUCATION AND EXPERIENCE

When NASA was formed in 1958 and the need for an astronaut corps was first recognized, a decision had to be made on criteria for recruiting astronauts. Robert Sherrod, in *Apollo Expeditions to the Moon*, states that President Eisenhower was responsible for the decision to choose astronauts from the ranks of military test pilots.

> In December 1958, plans had been made to post civil service notices inviting applications for astronaut service, GS-12 to GS-15, salary $8,330 to $12,770. President Eisenhower thought this ridiculous, and decided that the rolls of military test pilots would furnish all the astronauts necessary. "It was one of the best decisions he ever made," said Robert Gilruth sixteen years later. "It ruled out the matadors, mountain climbers, scuba divers, and race drivers and gave us stable guys who had already been screened for security." [1]

The requirements for this first group of astronauts were officially established as: Be less than 40 years of age, have a bachelor's degree in engineering or its equivalent, be a graduate of a test pilot school, and be a qualified jet pilot with at least 1,500 hours of flying time. The selection resulted in choosing the seven Mercury astronauts, all military jet test pilots: Lt. M. Scott Carpenter, USN; Capt. L. Gordon Cooper, Jr., USAF; Lt. Col. John Glenn, Jr., USMC; Capt. Virgil "Gus" Grissom, USAF; Lt. Comdr. Walter Schirra, Jr., USN; Lt. Comdr. Alan Shepard, USN; and Capt. Donald "Deke" Slayton, USAF. Three had engineering degrees (Cooper, Grissom and Slayton), two had bachelor of science degrees from the Naval Academy (Schirra and Shepard), and two had attended college but not received degrees (Carpenter and Glenn).

For the second group of astronauts, chosen in 1962, requirements were changed slightly, with the age bracket lowered to 35 years of age and educational experience broadened to include degrees in the physical or biological sciences as well as engineering. This person also had to have "experience as a jet test pilot having attained experimental flight test status through the military services, the aircraft industry or NASA, or having graduated from a military test pilot school. Preference will be given to those presently engaged in flying high-performance aircraft." This latter modification opened the selecton process to civilians, and in the group of nine chosen, two were civilians (Neil Armstrong and Elliot See). In addition, there were four from the Air Force (Maj. Frank Borman, Capt. James McDivitt, Capt. Thomas Stafford, and Capt. Edward White II), and three from the Navy (Lt. Charles "Pete" Conrad, Jr., Lt. Comdr. James Lovell, and Lt. Comdr. John Young). Three of the men (Borman, See and White) had master's degrees in engineering, four had bachelor's degrees in engineering (Armstrong, Conrad, McDivitt and Young), and two received bachelor degrees of science from the Naval Academy (Lovell and Stafford).

---

[1] Robert Sherrod. Men for the Moon; How They Were Chosen and Trained. In Edgar Cortright., ed. Apollo Expeditions to the Moon. Washington, D.C., National Aeronautics and Space Administration, 1975. p. 146.

Another change in the qualifications was made for the third group of astronauts in 1963. They were required to have only 1,000 hours flight time, and the age limit was lowered to 34. The change in flying time allowed for increased emphasis on academics rather than flight experience and opened the field to non-test pilots. Fourteen men were selected, eight of whom had advanced degrees: Maj. Edwin "Buzz" Aldrin, Jr., USAF (Ph.D., astronautics); Capt. William Anders, USAF (M.S., engineering); Capt. Charles Bassett II, USAF (B.S., engineering); Lt. Alan Bean, USN (B.S., engineering); Lt. Eugene Cernan, USN (M.S., engineering); Lt. Roger Chaffee, USN (B.S., engineering); Capt. Michael Collins, USAF (B.S. from the U.S. Military Academy); R. Walter Cunningham, civilian (M.S., physics); Capt. Donn Eisele, USAF (M.S., astronautics); Capt. Theodore Freeman, USAF (M.S., engineering); Lt. Comdr. Richard Gordon, USN (B.S., chemistry); Russell Schweickart, civilian (M.S., aeronautics and astronautics); Capt. David Scott, USAF (M.S., aeronautics and astronautics); and Capt. Clifton Williams, Jr., USMC (B.S., engineering).

In this group, there were two civilians, along with seven men from the Air Force, four from the Navy, and one from the Marine Corps. Even though qualifications were changing, the military was still supplying the large majority of astronauts (26 of the 30 chosen by 1963).

The fourth group of astronauts differed significantly from its predecessors, for this was the first group of "scientist-astronauts." Applicants were required to hold a doctoral degree in one of the natural sciences, medicine or engineering. The National Academy of Sciences evaluated the applications for scientific criteria, and NASA made the final determination of six men to become astronauts: Dr. Owen Garriott (engineering); Dr. Edward Gibson (engineering); Dr. Duane Graveline (medicine); Lt. Comdr. Joseph Kerwin, USN (medicine); Dr. F. Curtis Michel (physics); and Dr. Harrison "Jack" Schmitt (geology). For the first time, civilians outnumbered the military. The men were not required to have any flight experience, although two (Kerwin and Michel) already were jet pilots. With the exception of Graveline, who resigned from the corps shortly after selection, the others received one year of flight training.

The fifth group in 1966 followed the same qualifications as the third group except that the age limit was raised from 34 to 36, and nineteen astronauts were chosen: four civilians, seven Air Force pilots, six Navy pilots and two Marine Corps pilots. Eleven of the nineteen had advanced degrees. Those selected were: Vance Brand, civilian (B.S., engineering, as well as an M.B.A.); Lt. John Bull, USN (B.S., engineering); Maj. Gerald Carr, USMC (M.S., engineering); Capt. Charles Duke, USAF (B.S., engineering); Capt. Joe Engle, USAF (B.S., engineering); Lt. Comdr. Ronald Evans, USN (M.S., engineering); Maj. Edward Givens, Jr., USAF (B.S. from the Naval Academy); Fred Haise, Jr., civilian (B.S., engineering); Maj. James Irwin, USAF (M.S., engineering); Don Lind, civilian (Ph.D., physics); Capt. Jack Lousma, USMC (M.S., engineering); Lt.

Thomas Mattingly II, USN (B.S., engineering); Lt. Bruce McCandless II, USN (M.S., engineering); Comdr. Edgar Mitchell USN (Ph.D., aeronautics and astronautics); Maj. William Pogue, USAF (M.S., mathematics); Capt. Stuart Roosa, USAF (B.S., engineering); John Swigert, Jr., civilian (M.S., aerospace science); Lt. Comdr. Paul Weitz, USN (M.S., engineering); and Capt. Alfred Worden, USAF (M.S., engineering).

The sixth group was composed of scientist-astronauts like group IV, but this time all were civilians. The National Academy of Sciences again evaluated the applicants for scientific criteria, with NASA evaluating on the basis of medical and psychological tests. None of those chosen in this group in 1967 were pilots, so all were sent to jet pilot school for one year. The eleven astronauts chosen were: Joseph Allen (Ph.D., physics); Philip Chapman (Ph.D., instrumentation); Anthony England (M.S., physics); Karl Henize (Ph.D., astronomy); Donald Holmquest (M.D.); William Lenoir (Ph.D., engineering); John Llewellyn (Ph.D., chemistry); F. Story Musgrave (M.D.); Brian O'Leary (Ph.D., astronomy); Robert Parker (Ph.D., astronomy); and William Thornton (M.D.).

Members of the seventh group of astronauts to join NASA were transfers from the cancelled Manned Orbiting Laboratory program of the Department of Defense. Since the men had already qualified under the Air Force program, qualifications were not issued; however, the seven chosen from among the 14 pilots who applied to transfer were younger than age 36, and those not chosen were older than age 36. The seven transfers were: Maj. Karol Bobko, USAF (B.S. from the Air Force Academy); Lt. Comdr. Robert Crippen, USN (B.S., engineering); Maj. Charles Fullerton, USAF (M.S., engineering); Maj. Henry Hartsfield, USAF (B.S., physics); Maj. Robert Overmyer, USMC (M.S., astronauts); Maj. Donald Peterson, USAF (M.S., engineering); and Lt. Comdr. Richard Truly, USN (B.S., engineering).

For the eighth group of astronauts chosen in 1978, selection criteria were substantially different from those for the other seven groups of astronauts. Those in the mission specialist category were required to have only a bachelor's degree in engineering, physical or biological sciences, or mathematics, while those in the pilot category were required to have bachelor's degree in engineering, physical science or mathematics with at least 1,000 hours of first pilot time. Fifteen pilots were chosen from 659 pilot applicants, of which 147 were military and 512 were civilians (8 were women and 10 were minorities). Twenty mission specialists were chosen from the 5,680 mission specialist applicants of which 161 were from the military and 5,519 were civilians (1,251 were women and 338 were minorities). Those selected in the pilot category were: Lt. Cdr. Daniel Brandenstein, USN (B.S., mathematics/physics); Lt. Cdr. Michael Coats, USN (M.S., administration of science and technology); Maj. Richard Covey, USAF (M.S. aeronautical/astronautical engineering); Lt. Cdr. John Creighton, USN (B.S. from US Naval Academy); Lt. Robert Gibson, USN (B.S., aeronautical engineering); Maj. Frederick Gregory, USAF (B.S. from US Air Force Academy); Stanley Griggs, civilian (M.S., management engineering); Cdr. Frederick Hauck, USN (M.S., nuclear engineering); Lt. Cdr. Jon McBride, USN (B.S., aeronautical engineering); Capt. Steven Nagel, USAF

(B.S., aeronautical/astronautical engineering); Maj. Francis Scobee, USAF (B.S., aerospace engineering); Capt. Brewster Shaw, Jr., USAF (M.S., engineering mechanics); Capt. Loren Shriver, USAF (M.S., astronautics); Lt. Cdr. David Walker, USN (B.S. from US Naval Academy); and Lt. Cdr. Donald Williams, USN (B.S., mechanical engineering). Those selected in the mission specialist category were: Maj. Guion Bluford, USAF (Ph.D., aerospace engineering); Capt. James Buchli, USMC (M.S., aeronautical systems); Maj. John Fabian, USAF (Ph.D., aeronautics/astronautics); Anna Fisher, civilian (M.D.); Lt. Dale Gardner, USN (B.S., engineering physics); Terry Hart, civilian (M.S., mechanical engineering); Steven Hawley, civilian (Ph.D., astronomy); Jeffrey Hoffman (Ph.D., astrophysics); Shannon Lucid, civilian (Ph.D., biochemistry); Ronald McNair, civilian (Ph.D., physics); Capt. Richard Mullane, USAF (M.S., aeronautical engineering); George Nelson, civilian (Ph.D., astronomy); Capt. Ellison Onizuka, USAF (M.S., aerospace engineering); Judith Resnik, civilian (Ph.D., electrical engineering); Sally Ride, civilian (Ph.D., physics); Margaret Seddon, civilian (M.D.); Maj. Robert Stewart, USA (M.S., aerospace engineering); Kathryn Sullivan, civilian (Ph.D., geology); Norman Thagard, civilian (M.D.); and James van Hoften, civilian (Ph.D., fluid mechanics).

The ninth group of astronauts was chosen in 1980 using the same criteria as group eight. Of the nineteen astronauts selected, eight were chosen as pilots and eleven as mission specialists. In the pilot category were: Lt. Col. John Blaha, USAF (M.S., astronautical engineering); Maj. Charles Bolden, Jr., USMC (M.S., systems management); Lt. Col. Roy Bridges, Jr., USAF (M.S., astronautics); Maj. Guy Gardner, USAF (M.S., aeronautics and astronautics); Maj. Ronald Grabe, USAF (B.S., engineering science); Maj. Bryan O'Connor, USMC (M.S., aeronautical systems); Lt. Cdr. Richard Richards, USN (M.S., aeronautical systems); and Lt. Cdr. Michael Smith, USN (M.S., aeronautical engineering). The mission specialists were: Dr. James Bagian (medicine); Dr. Franklin Chang (physics); Dr. Mary Cleave (civil and aeronautical engineering); Bonnie Dunbar (M.S., ceramic engineering); Dr. William Fisher (medicine); Capt. David Hilmers, USMC (M.S., electrical engineering); Lt. Cdr. David Leestma, USN (M.S., aeronautical engineering); John Lounge (M.S., astrogeophysics); Capt. Jerry Ross, USAF (M.S., mechanical engineering); Maj. Sherwood Spring, USAF (M.S., aerospace engineering); and Lt. Col. Robert Springer, USMC (M.S., operations research and systems analysis).

In 1984, the tenth group was also chosen based on the same criteria as the previous two groups. Group ten included seven pilots and ten mission specialists. The pilot astronauts include: Maj. Kenneth Cameron, USMC (M.A., aeronautics and astronautics); Lt. Cmdr. Frank Culbertson, Jr., USN (B.S., aerospace engineering); Lt. Col. John Casper, USAF (M.A., astronautics); Capt. Sidney Gutierrez, USAF (M.A., management); Capt. Lloyd Hammond, Jr., USAF (M.A., engineering mechanics); Lt. Cmdr. Michael McCulley, USN (M.A., metallurgical engineering); Lt. James Wetherbee, USN (B.A., aerospace engineering). The mission specialists include: Maj. James Adamson, USA (M.A., aeronautics and mechanical engineering); Capt. Mark Brown, USAF (M.A., engineering); Cmdr. Manley Carter, Jr., USN (M.D.); Marsha Ivins (B.S., aerospace engineering);

Capt. Mark Lee, USAF (M.A., mechanical engineering); George Low (M.A., aeronautics and astronautics); Lt. Cmdr. William Shepard, USN (M.A., engineering); Ellen Shulman (M.D.); Kathryn Thornton (Ph.D., physics); Charles Veach (B.S., engineering management).

In summary, educational and experience qualifications for the pilot astronauts (groups I, II, III and V) varied only slightly from 1959 to 1966, with the major change occurring in group II when civilians were allowed to apply. Other changes includes lower age limits, reduction of required number of flying hours from 1,500 to 1,000, and increased emphasis on academic degrees. Criteria for the two groups of scientist-astronauts (groups IV and VI) were basically the same, the only difference being that those chosen with group VI were not required to have earned their doctoral degrees by the time of selection. The astronauts chosen since 1978 have had more lenient criteria for selection than their predecessors.

Of the 144 men and women chosen as astronauts, 95 were reassigned from the military, and 21 of the 49 civilians had been in the military prior to selection as an astronaut. Of those reassigned, 45 were from the Air Force, 36 were from the Navy, 11 were from the Marine Corps, and 3 were from the Army. Table 1-3 provides a breakdown of service affiliations at the time of selection into the astronaut corps. The 28 who never served in the military were all chosen as scientist-astronauts or mission specialists in group IV, VI, VIII, IX, or X: Allen, Chang; Cleave; Dunbar; England; A. Fisher; W. Fisher; Garriott; E. Gibson; Hawley; Hoffman; Holmquest; Ivins; Lenoir; Llewellyn; Low; Lucid; McNair; Nelson; O'Leary; Parker; Resnik; Ride; Schmitt; Seddon; Shulman; Sullivan; and K. Thornton.

TABLE 1-3

SERVICE AFFILIATION OF ASTRONAUTS AT TIME OF SELECTION

Air Force	Navy	Marine Corps	Army
Aldrin	Bean	Bolden	Adamson
Anders	Brandenstein	Buchli	Spring
Bassett	Bull	Cameron	Stewart
Blaha	Carpenter	Carr	
Bluford	Carter	Glenn	
Bobko	Cernan	Hilmers	
Borman	Chaffee	Lousma	
Bridges	Coates	O'Connor	
Brown	Conrad	Overmyer	
Casper	Creighton	Springer	
Collins	Crippen	Williams	
Cooper	Culbertson		
Covey	Evans		
Duke	Gardner, D.		
Eisele	Gibson, R.		
Engle	Gorden		
Fabian	Hauck		
Freeman	Kerwin		
Fullerton	Leestma		
Gardner, G.	Lovell		
Givens	Mattingly		
Grabe	McBride		
Gregory	McCandless		
Grissom	McCulley		
Gutierrez	Mitchell		
Hammond	Richards		
Hartsfield	Schirra		
Irwin	Shepard, A.		
Lee	Shepard, W.		
McDivitt	Smith		
Mullane	Truly		
Nagel	Walker		
Onizuka	Weitz		
Peterson	Wetherbee		
Pogue	Williams		
Roosa	Young		
Ross			
Scobee			
Scott			
Shaw			
Shriver			
Slayton			
Stafford			
White			
Worden			

TABLE 1-3 (cont.)

CIVILIAN ASTRONAUT SERVICE AFFILIATION PRIOR TO TIME OF SELECTION

Air Force	Navy	Marine Corps	Army
Chapman*	Armstrong	Brand	Bagian
Graveline	Griggs	Cunningham	
Hart	Henize	Haise**	
Michel	Lind	Musgrave***	
Schweickart	Lounge	Thagard	
Swigert	See		
Thornton	van Hoften		
Veach			

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*Chapman served in the Royal Australian Air Force.

**Haise served in both the Marine Corps and the Air Force.

***Musgrave served in both the Marine Corps and the Navy.

At the time they were selected, two of the astronauts had no college degree but qualified under "equivalent experience," 42 had bachelor's degrees, 62 had master's degrees, and 38 had doctoral degrees. Of these degrees, there were: 69 in engineering; 18 in aeronautics and/or astronautics; 12 in medicine; 9 B.S. degrees from the service academies; 9 in physics; 5 in astronomy; 2 in chemistry; and 1 each in business administration (although he also held a B.S. in engineering), geology, physics and geology combined, astrophysics, astrogeophysics, mathematics, math/physics, engineering physics, earth sciences, administration of science and technology, information systems, systems management, management engineering, engineering mechanics, fluid mechanics, biochemistry, and operations research and systems analysis. Table 1-4 shows the educational status of the astronauts at the time they were accepted into the program.

TABLE 1-4

EDUCATIONAL STATUS OF ASTRONAUTS AT TIME OF SELECTION*

Bachelor's

Armstrong (engineering)
Bassett (engineering)
Bean (engineering)
Bobko (B.S.)
Brandenstein (math/physics)
Bull (engineering)
Chaffee (engineering)
Collins (B.S.)
Conrad (engineering)
Cooper (engineering)
Creighton (B.S.)
Crippen (engineering)
Culbertson (engineering)
Engle (engineering)
Gardner, D. (eng. physics)
Gibson, R. (engineering)
Givens (B.S.)
Gordon (chemistry)
Grabe (engineering)
Grissom (engineering)
Haise (engineering)
Hartsfield (physics)
Ivins (engineering)
Lovell (B.S.)
Mattingly (engineering)
McBride (engineering)
McDivitt (engineering)
Nagel (engineering)
Roosa (engineering)
Schirra (B.S.)
Scobee (engineering)
Shepard, A. (B.S.)
Slayton (engineering)
Stafford (B.S.)
Sullivan (earth sciences)
Truly (engineering)
Veach (eng. mgmt.)
Walker (B.S.)
Wetherbee (engineering)
Williams, C.C. (engineering)
Williams, D.E. (engineering)
Young (engineering)

Master's

Adamson (A/A** & engineering)
Anders (engineering)
Blaha (engineering)
Bolden (systems mgmt.)
Borman (engineering)
Brand (business admin.)
Bridges (A/A)
Brown (engineering)
Buchli (A/A)
Cameron (A/A)
Carr (engineering)
Casper (A/A)
Cernan (engineering)
Coats (adm. science and technology)
Covey (engineering)
Cunningham (physics)
Duke (A/A)
Dunbar (engineering)
Eisele (A/A)
England (physics/geology)
Evans (engineering)
Freeman (engineering)
Fullerton (engineering)
Gardner, G. (A/A)
Gregory (information systems)
Griggs, (mgmt. eng.)
Gutierrez (management)
Hammond (eng. mechanics)
Hart (engineering)
Hauck (engineering)
Hilmers+ (engineering)
Irwin (engineering)
Lee (engineering)
Leestma (engineering)
Lounge (astrogeophysics)
Lousma (engineering)
Low (A/A)
McCandles (engineering)
McCulley (engineering)
Mullane (engineering)

Doctorate

Aldrin (A/A)**
Allen (physics)
Bagian (Ph.D.)
Bluford (engineering)
Carter (M.D.)
Chang (physics)
Chapman (engineering)
Cleave (engineering)
Fabian (A/A)
Fisher, A. (M.D.)
Fisher, W. (M.D.)
Garriott (engineering)
Gibson, E. (engineering)
Graveline (M.D.)
Hawley (astronomy)
Heinze (astronomy)
Hoffman (astrophysics)
Holmquest (M.D.)
Kerwin (M.D.)
Lenoir (engineering)
Lind (physics)
Llewellyn (chemistry)
Lucid (biochemistry)
McNair (physics)
Michel (physics)
Mitchell (A/A)
Musgrave (M.D.)
Nelson (astronomy)
O'Leary (astronomy)
Parker (astronomy)
Resnik (engineering)
Schmitt (geology)
Seddon (M.D.)
Shulman (M.D.)
Thagard (M.D.)
Thornton, K. (physics)
Thornton, W. (M.D.)
van Hoften (fluid mechanics)

TABLE 1-4 (cont.)

Bachelor's	Master's	Doctorate
	O'Connor (A/A)	
	Onizuka (engineering)	
	Overmyer (A/A)	
	Peterson (engineering)	
	Pogue (mathematics)	
	Richards (A/A)	
	Ride (physics)	
	Ross (engineering)	
	Schweickart (A/A)	
	Scott (A/A)	
	See (engineering)	
	Shaw (eng. mechanics)	
	Shepard, W. (engineering)	
	Shriver (A/A)	
	Smith (engineering)	
	Spring (engineering)	
	Springer (ops res. & systems analysis)	
	Stewart (engineering)	
	Swigert (A/A)	
	Weitz (engineering)	
	White (engineering)	
	Worden (engineering)	

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* Two did not have a college degree at time of selection (Carpenter and Glenn).

** A/A refers to a degree in aeronautics, astronautics, aerospace sciences, or aeronautics and astronautics combined. Scott also received an engineer of aeronautics and astronautics from MIT.

+ Hilmers also received the degree of electrical engineer from the U.S. Naval Postgradute School.

2. MEDICAL AND PSYCHOLOGICAL

In addition to the education and experience qualifications, the first seven groups of astronauts had to pass vigorous medical and psychological tests. Dr. Robert Voas, a psychologist who was the Mercury astronauts' training director, is quoted as giving the following characteristics as requirements:

> . . . intelligence without genius, knowledge without inflexibility, bravery without foolhardiness, self-confidence without egotism, physical fitness without being muscle-bound, a preference for participatory over spectator sports, frankness without blabbermouthing, enjoyment of life without excess, humor without disproportion, fast reflexes without panic in a crisis.[2]

To identify people who could meet these qualifications, medical and psychological tests were administered over five days, consisting of the following components:

1. Medical history and review of systems.
2. Physical examination.
3. Electrocardiographic examinations, including routine electrocardiographic studies at rest, during hyperventilation, carotid massage, and breath holding, a double Master exercise tolerance test, a cold pressure test, and a precordial map.
4. Treadmill exercise tolerance test.
5. Vectorcardiographic study.
6. Phonocardiographic study.
7. Tilt table studies.
8. Pulmonary function studies.
9. Radiographic studies, including cholecystograms, upper GI series, lumbosacral spine, chest, cervical spine, and skull films.
10. Body composition study, using tritium dilution.
11. Laboratory examinations, including complete hematology workup, urinalysis, serologic test, glucose tolerance test, acid alkaline phosphatase, BUN, sodium, potassium, bicarbonate, chloride, calcium, phosphorus, magnesium, uric acid, bilirubin (direct and indirect), thymol turbidity cephalin flocculation, SGOT, SGPT, total protein with albumin and globulin, separate determination of Alpha 1 and Alpha 2, Beta and Gamma Globulins, protein bound iodine, creatinine, cholesterol, total lipids and phospholipids, hydroxproline, and RBC intracellular sodium and potassium. Stool specimens were examined for occult blood and microscopically for ova and parasites. A urine culture for bacterial growth was done, and a 24-hour specimen analyzed for 17-ketosteroids and 17-hydroxycorticosteroids.
12. Detailed examination of the sinuses, larynx, and Eustachian tubes.
13. Vestibular studies.
14. Diagnostic hearing tests.
15. Visual fields and special eye examinations.
16. General surgical evaluation.
17. Procto-sigmoidoscopy.
18. Dental examination.
19. Neurological examination.

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[2] Ibid., p. 146.

20. Psychologic summary, including Weschler Adult Intelligence Test, Bender Visual-Motor Gestalt Test, Rorschach Test, Thematic Apperception Test, Draw-A-Person Test, Gordon Personal Profile, Edwards' Personal Preference Schedule, Miller Analogies Test, and Performance Testing.

21. Electroencephalographic studies.

22. Centrifuge testing.[3]

Michael Collins (Gemini 10, Apollo 11) has provided a more humanistic perspective of what all those tests were like:

> Monday morning you arrived, fasting, to be greeted by a pleasant lab technician, part Dracula and part leech, who takes what seems to be a quart of blood. You then breakfast on a large beakerful of glucose . . . and are punctured with more needles at regular intervals during the remainder of the morning . . . Inconvenience is piled on top of uncertainty on top of indignity, as you are poked, prodded, pummeled, and pierced. No orifice is inviolate, no privacy respected. . . . Cold water is poured into one of your ears, causing your eyeballs to gyrate wildly as conflicting messages are relayed to your brain from one warm and one cold semicircular canal. Your body is taped with electrocardiogram sensors and you are ordered onto a treadmill, which maintains its inexorable pace up an imaginary mountain road. As the tilt becomes steeper, the heart rate increases, until it finally reaches 180 per minute. . . . Your fanny is violated by the "steel eel," a painful and undignified process by which one foot of lower bowel can be examined. . . .
>
> Then the shrinks take over where their more stable compatriots leave off. Thrust and parry. What are inkblots supposed to be anyway? Is one crotch in ten pictures too many? How can I describe the blank, white piece of paper this year? Last year I said it was nineteen polar bears fornicating in a snowbank, and the interviewer's face tightened in obvious displeasure over my lack of reverence for his precious cards. Hostile, they said I was. But not this year. This year I want to fly to the moon, badly I want it, and I will describe that white card in any way that will please them. Perhaps I see a great white room in it, or a picture of Mother and Dad, with Dad a little larger than Mother. Second-guessing the shrinks is not easy.[4]

Some interesting statistics can be derived from those who did pass through all the tests and became astronauts. In a study of the 29 Apollo astronauts, it was found that seven were left-handed (over twice what the odds would predict), nine were not chosen by NASA the first time they applied, and two had to apply three times. In addition, 22 were first-born children (six of whom wre only children), another five were oldest sons, and only two had older brothers, and one of those "hardly knew his brother, who was 13 years older" and received the "only-son treatment the second time around."[5] Although these statistics represent only 29 of the 73 astronauts selected from 1959–1969, they can be used as a representative sampling of the astronaut corps.

The astronauts chosen since 1978 were required to pass a Class I physical (as described above) only if they were selected as pilots. Mission specialists had to pass a Class II physical, which has more relaxed standards for sight and hearing.

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[3] Richard S. Johnston, Lawrence F. Dietlein, and Charles A. Berry, eds. Biomedical Results of Apollo. Washington, D.C., National Aeronautics and Space Administration, 1975. pp. 45–46.

[4] Michael Collins. Carrying the Fire: An Astronaut's Journey. New York, Farrar, Straus and Giroux, 1974. pp. 27–28.

[5] Sherrod, op. cit., p. 152.

NASA
JIM ADAMSON
JSC HOUSTON

B. BIOGRAPHIES OF NASA ASTRONAUTS

James C. Adamson; Major, USA; born March 3, 1946, Warsaw, New York; married, one child.

Received bachelor of science in engineering from U.S. Military Academy (1969), and master of science in aerospace engineering from Princeton University (1977). He then became an Assistant Professor of aerodynamics at West Point. In 1980, he began employment at Johnson Space Center, serving as aerodynamics officer in Mission Control. Adamson was selected as an astronaut candidate in May 1984, and recently became eligible for future mission assignments.

Edwin "Buzz" Eugene Aldrin, Jr.; Colonel, USAF (Retired); born January 20, 1930, Montclair, New Jersey; married, three children (by previous marriage).

Received bachelor of science degree from the U.S. Military Academy (1951), doctor of science in astronautics from the Massachusetts Institute of Technology (1963), and was chosen with the third group of astronauts in 1963. Colonel Aldrin was backup pilot for Gemini 9, pilot for Gemini 12, backup command module pilot for Apollo 8, and lunar module pilot for Apollo 11 (second man to walk on the Moon). He retired from NASA in July 1971 to become Commandant of the Aerospace Research Pilot's School at Edwards Air Force Base, California. On March 1, 1972, he retired from the Air Force and became a consultant for the Comprehensive Care Corporation, Newport Beach, California. He is currently a consultant in Los Angeles and a professor of astronautics at the University of North Dakota. His book, *Return to Earth,* describes some post-flight experiences and problems he encountered as an astronaut.

Joseph Percival Allen IV; civilian; born June 27, 1937, Crawfordsville, Indiana; married, two children.

Received bachelor of arts degree in math-physics from DePauw University (1959), master of science in physics from Yale University (1961), doctorate of nuclear physics from Yale (1965), and was chosen with the sixth group of astronauts in 1967. He was mission scientists for Apollo 15 and served on the staff of the President's Council on International Economic Policy. He served as the Director of the Legislative Affairs Division at NASA headquarters from 1975 to 1978. He was a mission specialist on STS-5 and STS 51-A, during which Allen and Gardner performed EVAs to retrieve two satellites. Allen has retired from NASA to become Executive Vice President of Space Industries, Inc.

William Alison Anders; Brigadier General, USAFR; born October 17, 1933, Hong Kong; married, six children.

Received bachelor of science degree from the U.S. Naval Academy (1955), master of science in nuclear engineering from the Air Force Institute of Technology (1962), and was chosen with the third group of astronauts in 1963. Colonel Anders was backup pilot for Gemini 11, lunar module pilot for Apollo 8, and backup command module pilot for Apollo 11. He resigned from NASA and the Air Force (active duty) in September 1969 and became Executive Secretary of the National Aeronautics and Space Council. In 1973, he joined the Atomic Energy Commission, and in 1974, became chairman of the Nuclear Regulatory Commission. He resigned that position in the spring of 1976 and was named U.S. Ambassador to Norway, a position he resigned in the summer of 1977. He joined General Electric as General Manager, Nuclear Energy Products Division and later was Vice President and General Manager of GE's Aircraft Equipment Division. He is now Executive Vice President, Aerospace, for Textron, Inc.

Neil Alden Armstrong; civilian; born August 5, 1930, Wapakoneta, Ohio; married, two children.

Received bachelor of science degree in aeronautical engineering from Purdue University (1955), was an aviator in the U.S. Navy, received master of science in aerospace engineering from the University of Southern California (1970), and was chosen with the second group of astronauts in 1962. Prior to his selection, Mr. Armstrong was engaged in the X-15 program, and made 7 flights of the X-15, reaching an altitude of 207,500 feet (see Chapter 3). He was backup command pilot for Gemini 5, command pilot for Gemini 8, backup command pilot for Gemini 11, backup commander for Apollo 8, and commander for Apollo 11 (first man to walk on the Moon). In July 1970 he became Deputy Association Administrator for Aeronautics at NASA. In August 1971 he resigned that position, and became Professor of Aeronautical Engineering at the University of Cincinnati. He is currently Chairman of the Board of Computing Technologies for Aviation, Inc. Armstrong was appointed to the National Commission on Space in 1985.

James Philip Bagian; civilian; born February 22, 1952, Philadelphia, Pennsylvania; married.

Received bachelor of science in mechanical engineering from Drexel University (1973); doctor of medicine from Thomas Jefferson University (1977). Worked as a mechanical engineer at the U.S. Naval Air Test Center at Patuxent River, Maryland, from 1976 to 1978; completed a general surgery residency at the Geisinger Medical Center in Danville, Pennsylvania; worked as a flight surgeon and research officer at Lyndon B. Johnson Space Center in 1978; completed studies at the USAF Flight Surgeons School and USAF School of Aerospace Medicine in San Antonio, Texas. He was completing a residency in anesthesiology at the University of Pennsylvania when he was chosen as a mission specialist astronaut candidate in 1980. He is currently in training as a mission specialist for a future space lab mission.

Charles Arthur Bassett II; Major, USAF; born December 30, 1931, Dayton, Ohio; died February 28, 1966, near St. Louis, Missouri, in the crash of a T-38 jet; was married, two children.

Received a bachelor of science in electrical engineering from Texas Technological College (1960) and was selected with the third group of astronauts. Major Basset had been chosen to pilot Gemini 9.

Alan Lavern Bean; Captain, USN (Retired); born March 15, 1932, Wheeler, Texas; divorced, two children.

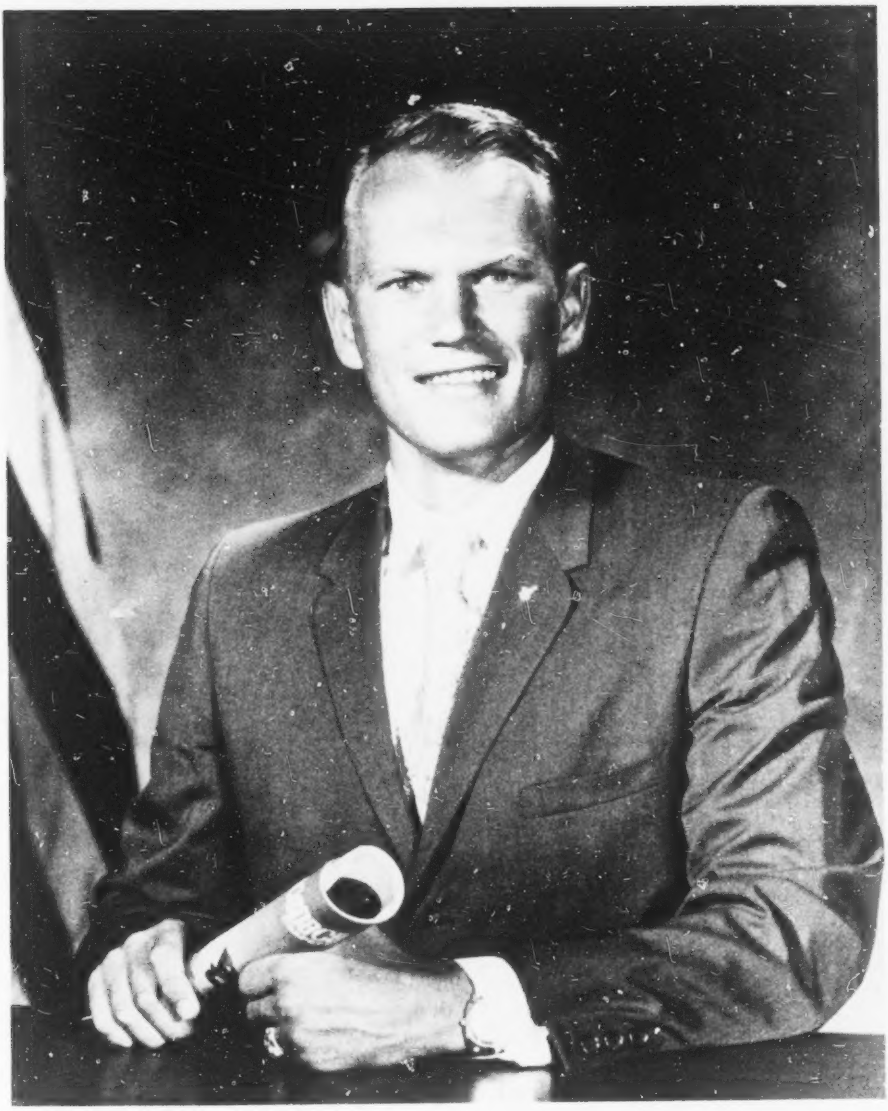
Received a bachelor of science degree in aeronautical engineering from the University of Texas (1955), and was chosen with the third group of astronauts in 1963. Captain Bean was backup command pilot for Gemini 10, backup lunar module pilot for Apollo 9, lunar module pilot for Apollo 12 (fourth man to walk on the Moon), commander for Skylab 3, and backup commander for the Apollo-Soyuz Test Project. He retired from the Navy in October 1975 and from NASA on June 26, 1981 to pursue a career as a painter.

John Elmer Blaha; Colonel, USAF; born August 26, 1942, San Antonio, Texas; married, three children.

Received bachelor of science in engineering science from the U.S. Air Force Academy (1965); master of science in astronautical engineering from Purdue University (1966); served as a combat pilot during the Vietnam War; graduated from the USAF Aerospace Research Pilot School at Edwards Air Force Base, California; was an instructor pilot at the USAF Test Pilot School; and worked for the Assistant Chief of Staff, Studies and Analyses, at Headquarters USAF in the Pentagon. He was chosen as a pilot astronaut candidate in 1980. He is training to fly as a pilot on STS 61-H.

Guion Stewart Bluford; Colonel, USAF; born November 22, 1942, Philadelphia, Pennsylvania; married, two children.

Received bachelor of science in aerospace engineering from Pennsylvania State University (1964); master of science (1974) and doctorate (1977) in aerospace engineering from the Air Force Institute of Technology; and was chosen with the eighth group of astronauts in 1978. He served as a mission specialist for the STS-8 mission, the first American black in space. He is in training as a mission specialist for the Spacelab D-1 flight (STS 61-A).

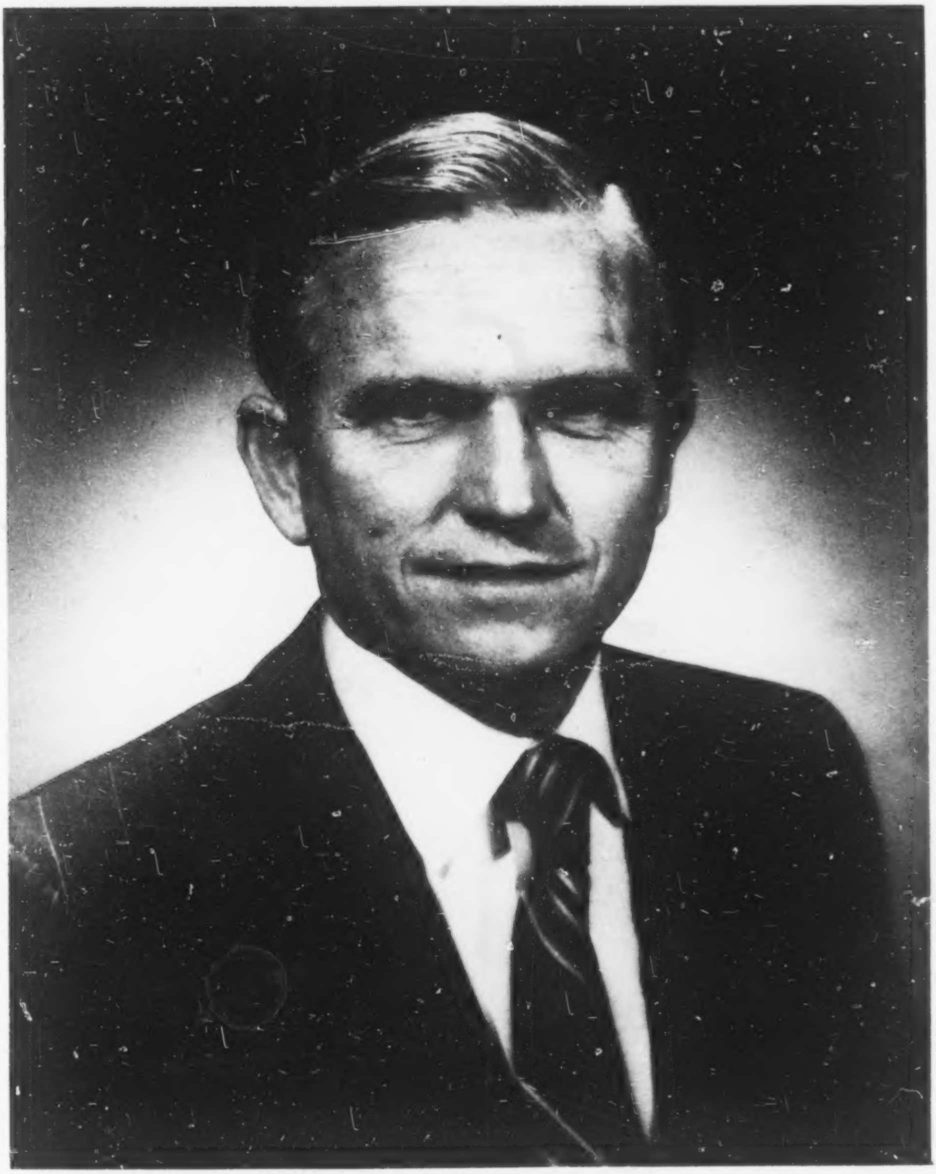


Karol Joseph Bobko; Colonel, USAF; born December 23, 1937, New York, New York; married, two children.

Received bachelor of science degree from the U.S. Air Force Academy (1959), master of science in aerospace engineering from the University of Southern California (1970), was selected for the MOL program (see Chapter 3) in 1966, and transferred to the NASA astronaut group in 1969. He was a crew member of the Skylab Medical Experiments Altitude Test, and was part of the support crew for the Apollo-Soyuz Test Project. He was pilot for the STS-6 mission, and commander of STS 51-D. He has been named as commander of STS 51-J, the first flight of the fourth orbiter.

Charles Frank Bolden, Jr.: Lieutenant Colonel, USMC; born August 19, 1946; Columbia, South Carolina; married, two children.

Received bachelor of science in electrical science from the U.S. Naval Academy (1968); master of science in systems management from the University of Southern California (1978); and was a combat pilot in Vietnam. He graduated from the U.S. Naval Test Pilot School in Patuxtent River, Maryland, in 1979 and was a test pilot at the Naval Air Test Center when he was chosen as a pilot astronaut candidate in 1980. He has been selected to serve as pilot on STS 61-C.

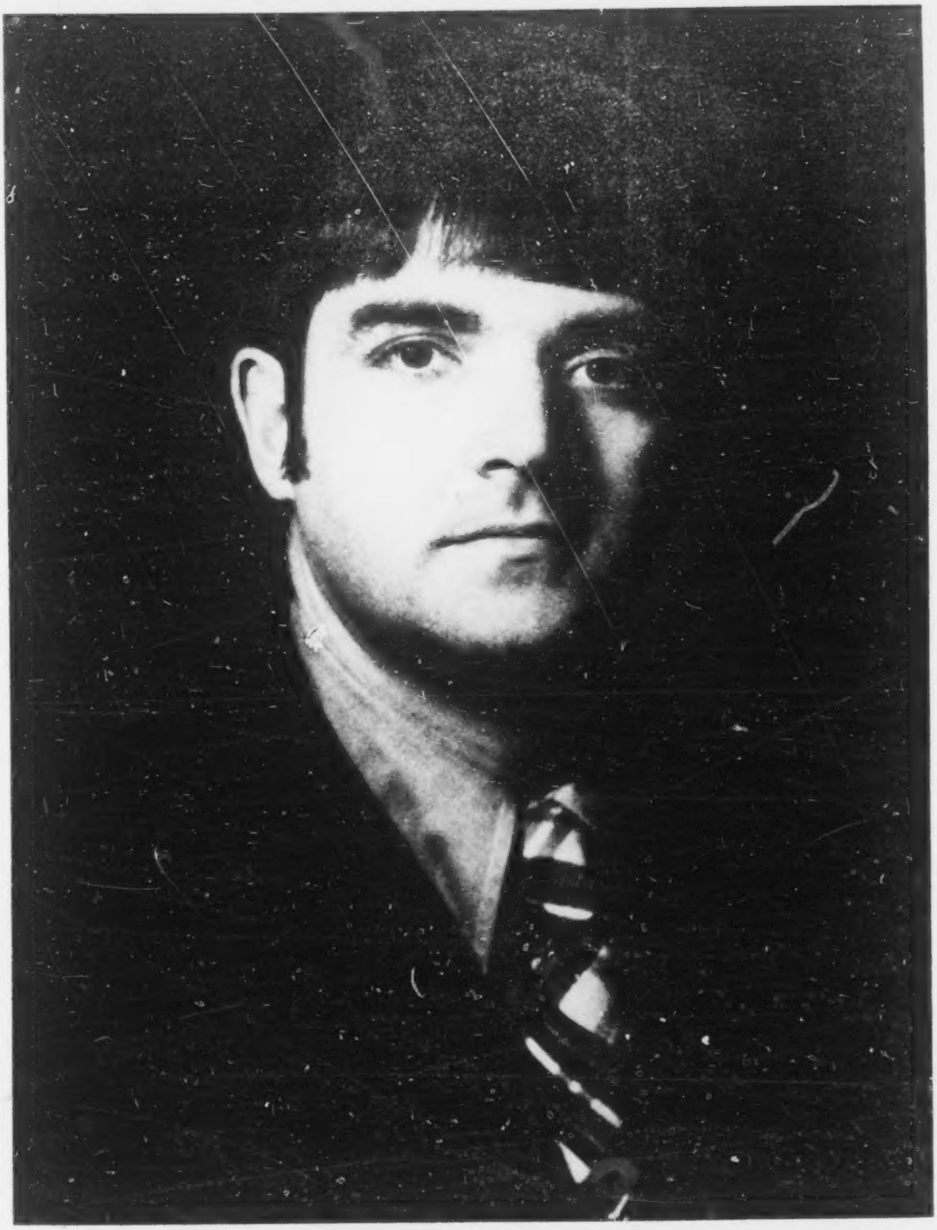


Frank Borman; Colonel, USAF (Retired); born March 14, 1928, Gary, Indiana; married, two children.

Received bachelor of science degree from the U.S. Military Academy (1950), master of science in aeronautical engineering from the California Institute of Technology (1957), and was chosen with the second group of astronauts in 1962. Colonel Borman was backup command pilot for Gemini 4, command pilot for Gemini 7, and commander of Apollo 8. In May 1969 he became Field Director of the Long-Term Space Station Program at NASA. He resigned from NASA and the Air Force on July 1, 1970, to become Senior Vice President, Operations Group for Eastern Airlines. He is now Eastern's President and Chief Executive Officer.

Vance Devoe Brand; civilian; born May 9, 1931, Longmont, Colorado; married, five children (four by a previous marriage).

Received bachelor of science degree in business administration from the University of Colorado (1953), bachelor of science in aeronautical engineering from the University of Colorado (1960), master of business administration from the University of California at Los Angeles (1964), served as an aviator with the U.S. Marine Corps, and was chosen with the fifth group of astronauts in 1966. Mr. Brand was backup command module pilot for Apollo 15, backup commander for Skylab 3 and Skylab 4, and was command module pilot for the Apollo-Soyuz Test Project. He was commander of the STS-5 mission and STS 41-B.



Daniel Charles Brandenstein; Captain, USN; born January 17, 1943, Watertown, Wisconsin; married, one child.

Received bachelor of science in mathematics/physics from the University of Wisconsin (1965) and was chosen with the eighth group of astronauts in 1978. He was pilot for the STS-8 flight, and commander for STS 51-G.

Roy Bunbard Bridges, Jr.; Colonel, USAF; born July 19, 1943, Atlanta, Georgia; married, two children.

Received bachelor of science in engineering science from U.S. Air Force Academy (1965); master of science in astronautics from Purdue University (1966); and was a combat pilot in Vietnam. He graduated from USAF Test Pilot School at Edwards Air Force Base, California (1970), and remained there as a test pilot until 1975. He was a special projects officer at Detachment 3 of the Air Force Flight Test Center when chosen as a pilot astronaut candidate in 1980. He has been selected to serve as pilot for the STS 51-F flight.

Mark N. Brown; Captain, USAF; born November 18, 1951, Valparaiso, Indiana; married, one child.

Received bachelor of science in aeronautical and astronautical engineering, Purdue University (1973), and masters in astronautical engineering, Air Force Institute of Technology (1980). He has been employed at Johnson Space Center since 1980. Brown was selected as an astronaut candidate in 1984 and, in 1985, became eligible for mission assignments.

James Frederick Buchli; Colonel, USMC; born June 20, 1945, New Rockford, South Dakota; married, two children.

Received bachelor of science from U.S. Naval Academy (1967); master of science and aeronautical systems from University of West Florida (1975), and was chosen with the eighth group of astronauts in 1978. Buchli was a member of the support crew for STS-1 and STS-2, and on-orbit CAPCOM for STS-2. He was a mission specialist on STS 51-C, the first Department of Defense mission. He has been designated to fly as mission specialist on the Spacelab D-1 mission.

John Sumter Bull; Lieutenant Commander, USN (Retired); born September 25, 1935, Memphis, Tennessee; married, two children. Received bachelor of science degree in mechanical engineering from Rice University (1957), a doctorate in aeronautics and astronautics from Stanford University (1973), and was chosen with the fifth group of astronauts in 1966. Commander Bull withdrew from the astonaut program and the Navy in 1968 due to pulmonary disease, and is currently a research scientist for aircraft guidance and navigation at NASA Ames Research Center, Moffett Field, California.

Kenneth D. Cameron; Major, USMC; born November 29, 1949, Cleveland, Ohio; married, one child.

Received bachelors and masters degrees in aeronautics and astronautics, Massachusetts Institute of Technology (1978 and 1979). Following assignment in Japan and in the Pacific, he completed U.S. Navy Test Pilot School. Cameron was selected in the 1984 astronaut class, and recently qualified for assignment as a pilot to future shuttle missions.

Malcolm Scott Carpenter; Commander, USN (Retired); born May 1, 1925, Boulder, Colorado; married, four children (by a previous marriage).

Attended University of Colorado although not graduating (awarded an earned degree of engineering after his space flight), and was chosen in the first group of astronauts in 1959. Commander Carpenter was backup pilot for Mercury-Atlas 6 (Friendship 7), and the pilot of Mercury-Atlas 7 (Aurora 7). An elbow injury from a motorbike accident in Bermuda in 1964 removed him from flight status, and he resigned from NASA in August 1967 to join the U.S. Navy Project Sealab. He retired from the Navy on July 1, 1969, and is now an engineering consultant in Los Angeles, California.

Gerald Paul Carr; Colonel, USMC (Retired); born August 22, 1932, Denver, Colorado; married, six chidren.

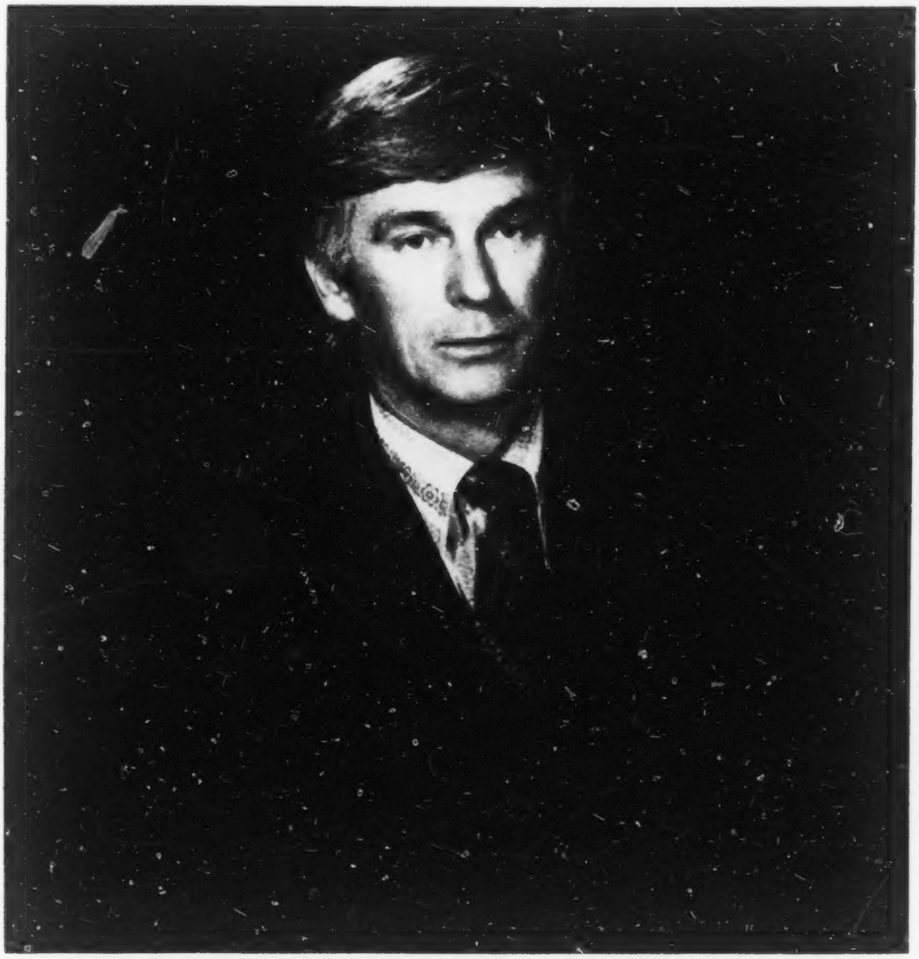
Received bachelor of science degree in mechanical engineering from the University of Southern California (1954), bachelor of science in aeronautical engineering from the U.S. Naval Postgraduate School (1961), master of science in aeronautical engineering from Princeton University (1962), and was chosen with the fifth group of astronauts in 1966. Colonel Carr was instrumental in the development of the lunar roving vehicle used by the Apollo 15, 16, and 17 astronauts, and was commander of Skylab 4. He retired from the Marine Corps in September 1975 and resigned from NASA in June 1977. He was Vice President, Bovay Engineers, Inc., and is currently a senior consultant for Applied Research Inc., in Houston, Texas.

ley Lanier Carter, Jr.; Commander, USN; born August 15, 47, Macon, Georgia; married, two children.

Received bachelor of arts in chemistry, Emery University (1969), and doctorate of medicine, Emory (1973). In 1974, he joined the Navy and completed flight surgeon school in Pensacola, Florida. Carter was selected in the 1984 astronaut class, and, in May 1985, qualified for future shuttle assignments.

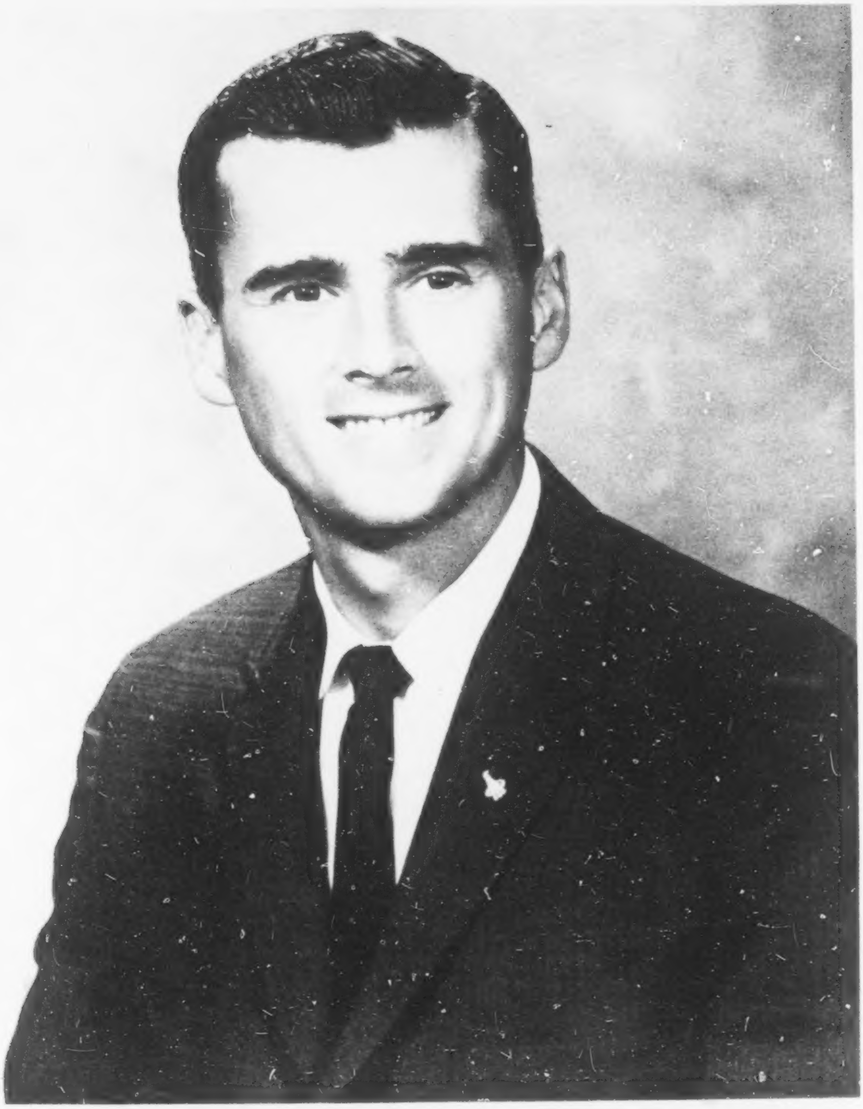
John H. Casper: Lieutenant Colonel, USAF; born July 9, 1943, Greenville, South Carolina; married, one child.

Received bachelor of science in engineering science, Air Force Academy (1966), and master of science in astronautics from Purdue University (1967). He was Deputy Chief of the Special Projects Office at Headquarters in the Pentagon when selected in the 1984 astronaut class. Following one year of training, Casper is now qualified for future shuttle assignments.



Eugene Andrew Cernan; Captain, USN (Retired), born March 14, 1934, Chicago, Illinois; married, one child.

Received bachelor of science degree in electrical engineering from Purdue University (1956), master of science in aeronautical engineering from Purdue and the Naval Postgraduate School (1961), and was chosen in the third group of astronauts in 1963. He became the pilot of Gemini 9 upon the death of a prime crew member, was backup pilot for Gemini 12, backup lunar module pilot for Apollo 7, lunar module pilot for Apollo 10, backup commander for Apollo 14, and commander for Apollo 17 (eleventh man to walk on the Moon). Captain Cernan was Deputy Director of the Apollo-Soyuz Test Project. He resigned from NASA and the Navy on July 1, 1976, to become Executive Vice President-International, Coral Petroleum, Inc., Houston, Texas. He is currently the head of Cernan Corporation, Houston, Texas.



Roger Bruce Chaffee; Lieutenant Commander, USN; born February 15, 1935, Grand Rapids, Michigan; died January 27, 1967, in the Apollo 204 fire at Cape Kennedy, Florida; was married, two children.

Received bachelor of science degree in aeronautical engineering from Purdue University (1957), and was chosen in the third group of astronauts in 1963. He had been selected as lunar module pilot for the first manned Apollo flight.

Franklin Ramon Chang-Diaz; civilian; born April 5, 1950, San Jose, Costa Rica (is a naturalized U.S. citizen); unmarried (two children by a previous marriage).

Received bachelor of science in mechanical engineering from the University of Connecticut (1973); doctorate in applied plasma physics from the Massachusetts Institute of Technology (1977); and worked on the technical staff of the Charles Stark Draper Laboratory on fusion reactors. He was chosen as a mission specialist astronaut candidate in 1980, and is currently assigned as a mission specialist on STS 62–C.

Philip Kenyon Chapman; civilian; born March 5, 1935, Melbourne, Australia; became U.S. citizen May 8, 1967; divorced, two children.

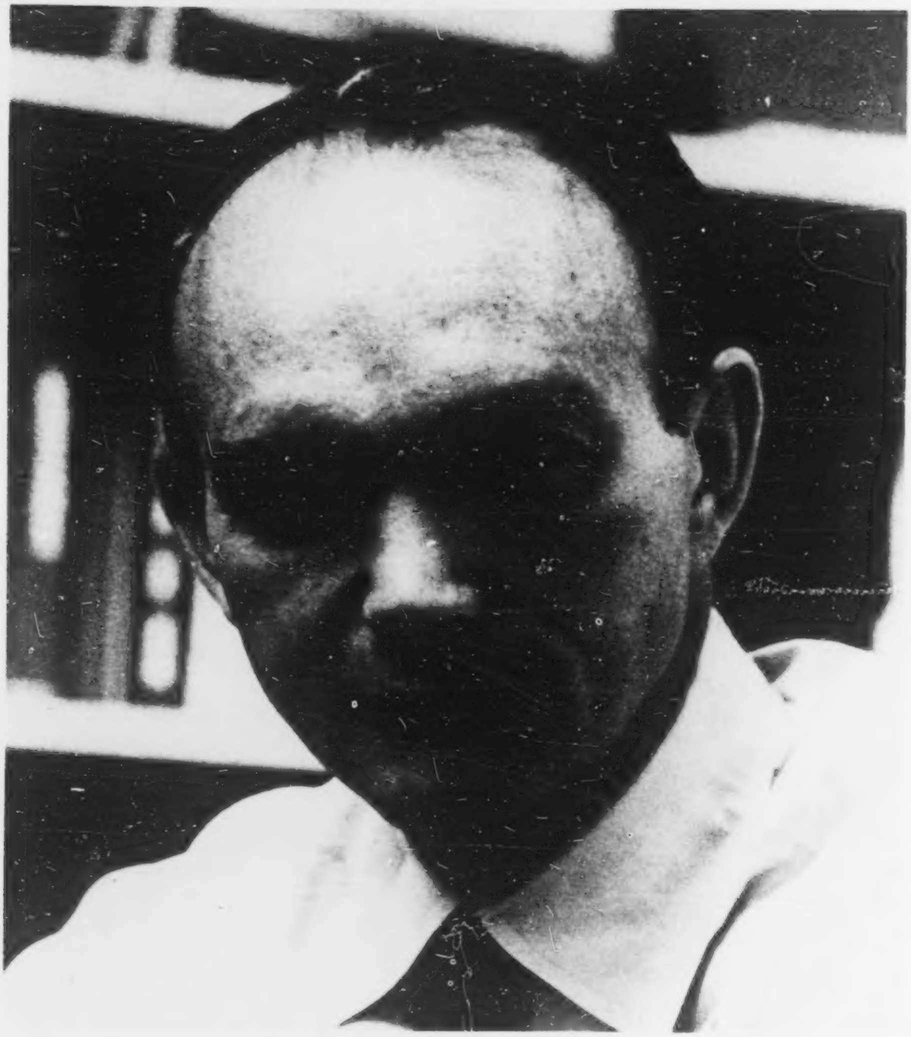
Received bachelor of science degree in physics and mathematics from Sydney University (1956), served in the Royal Australian Air Force Reserve, received master of science in aeronautics and astronautics from the Massachusetts Institute of Technology (1964), doctorate in instrumentation from MIT (1967), and was chosen in the sixth group of astronauts in 1967. Dr. Chapman resigned from NASA in July 1972 and took a position with AVCO Everett Research Laboratories in Everett, Massachusetts, as well as joining the MIT Measurement Systems Laboratory as a senior research associate. In September 1977, he left AVCO Everett and is currently with Arthur D. Little, Inc., in Cambridge, Massachusetts, as a senior staff member.

Mary Louise Cleave; civilian; born February 5, 1947, Southhampton, New York; unmarried.

Received bachelor of science in biological sciences from Colorado State University (1969); master of science in microbial ecology (1975); and a doctorate in civil and aeronautical engineering (1979) from Utah State University. She held research positions in the Ecology Center and the Utah Water Research Laboratory at Utah State University from 1971 to 1980, and was selected as a mission specialist astronaut candidate in 1980. She is currently assigned as a mission specialist for STS 61–B.

Michael Loyd Coats; Captain, USN; born January 16, 1946, Sacramento, California; married, two children.

Received bachelor of science from U.S. Naval Academy (1968); master of science in Administration of Science and Technology from the George Washington University (1977); and was chosen with the eighth group of astronauts. He was pilot on STS 41-D.



Michael Collins; Major General, USAFR; born October 31, 1930, Rome, Italy; married, three children.

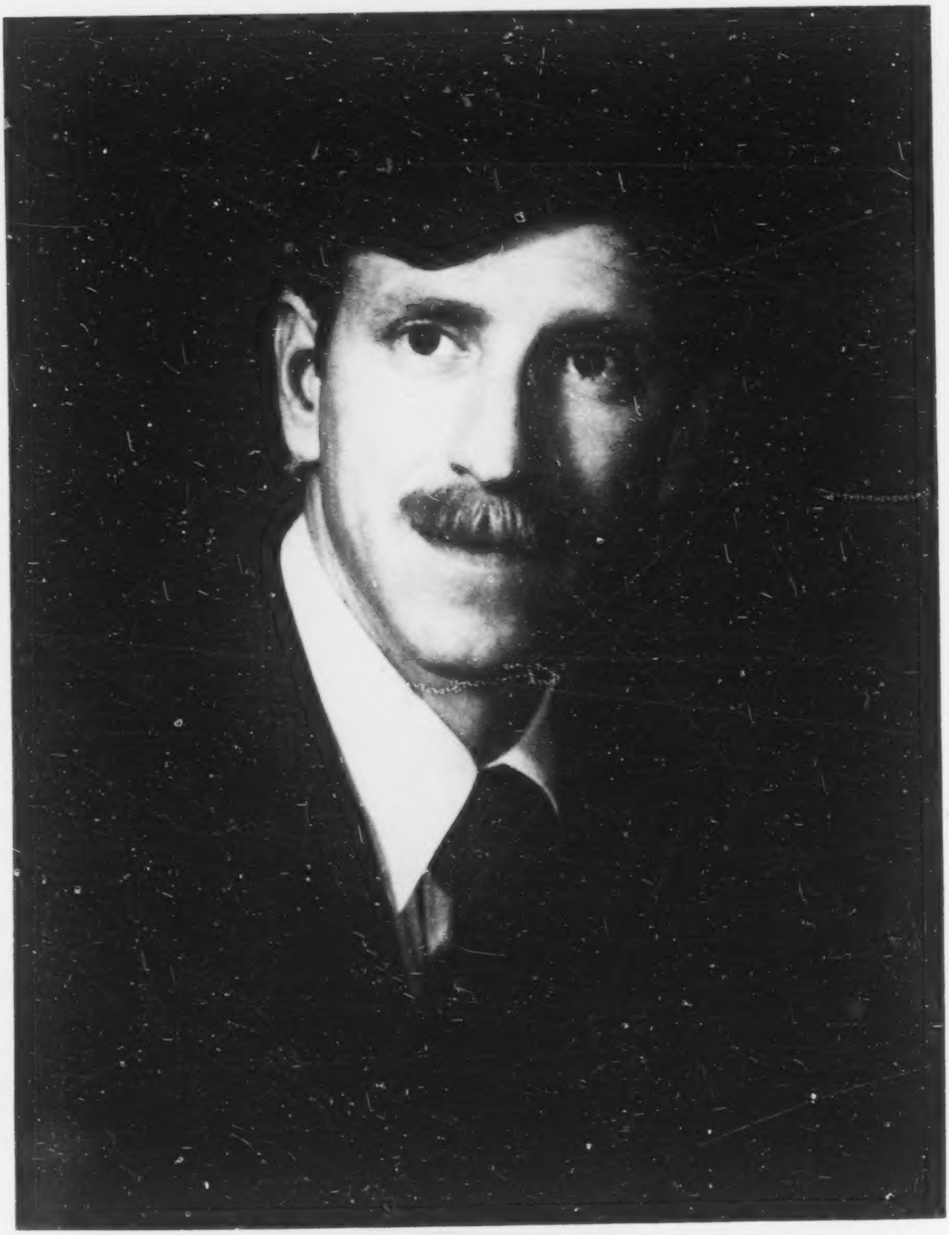
Received bachelor of science from the U.S. Military Academy (1952) and was chosen in the third group of astronauts in 1963. General Collins was backup pilot for Gemini 7, pilot for Gemini 10, assigned to Apollo 8 but removed to undergo surgery, and command module pilot for Apollo 11. In January 1970, he resigned from NASA and the Air Force (active duty) and was appointed Assistant Secretary of State for Public Affairs. In April 1971, he became Director of the National Air and Space Museum at the Smithsonian Institution. In April 1978, he was promoted to Under Secretary of the Smithsonian. In February 1980, he became Vice President, Field Operations, Vought Corporation, Arlington, Virginia. He currently heads Michael Collins Associates, a Washington consulting firm. His book, *Carrying the Fire,* describes his selection into the astronaut program and his experiences on Gemini 10 and Apollo 11. He has also written a children's book, *Flying to the Moon and Other Strange Places.*

Charles "Pete" Conrad, Jr.; Captain, USN (Retired); born June 2, 1930, Philadelphia, Pennsylvania; married, four children.

Received bachelor of science in aeronautical engineering from Princeton University (1953) and was chosen with the second group of astronauts in 1962. Captain Conrad was pilot of Gemini 5, backup command pilot of Gemini 8, command pilot for Gemini 11, backup commander for Apollo 9, commander for Apollo 12 (third man to walk on the Moon), and commander of Skylab 2. He resigned from both NASA and the Navy on February 1, 1974, to become Vice President and Chief Operating Officer of the American Television and Communications Corporation, a cable TV firm in Denver, Colorado. He is now Senior Vice-President, Marketing, Douglas Aircraft, McDonnell-Douglas Corporation, Long Beach, California.

Leroy Gordon Cooper, Jr.; Colonel, USAF (retired); born March 6, 1927, Shawnee, Oklahoma; married, two children (by a previous marriage).

Received bachelor of science degree in aeronautical engineering from the Air Force Institute of Technology (1956) and was chosen in the first group of astronauts in 1959. Colonel Cooper was backup pilot for Mercury-Atlas 8 (Sigma 7), pilot for Mercury-Atlas 9 (Faith 7), command pilot for Gemini 5, backup command pilot for Gemini 12, and backup commander for Apollo 10. He retired from NASA and the Air Force in July 1970 to form Gordon Cooper Associates in Hialeah, Florida. He then was Vice-President for Research and Development for WED Enterprises, Glendale, California. He is currently President of Vistec, Los Angeles.



Richard Oswalt Covey; Major, USAF; born August 1, 1946, Fayetteville, Arkansas; married, two children.

Received bachelor of science from U.S. Air Force Academy (1968); master of science in aeronautical/astronautical engineering from Purdue University (1969); and was chosen with the eighth group of astronauts in 1978. He is currently assigned as a pilot on STS 51-I.

John Oliver Creighton; Commander, USN; born April 28, 1943, Orange, Texas; married.

Received bachelor of science from U.S. Naval Academy (1966), and was chosen wih the eighth group of astronauts in 1978. Creighton served as pilot on STS 51-G.

Robert Laurel Crippen; Captain, USN; born September 11, 1937, Beaumont, Texas; married, three children.

Received bachelor of science degree in aerospace engineering from the University of Texas (1960), was selected for the MOL program (see chapter 3) in 1966, and transferred to the NASA astronaut group in 1969. He was commander of the Skylab Medical Experiments Altitude Test and was part of the support crew for Skylab 2, 3, and 4, and the Apollo-Soyuz Test Project. In April 1981, Crippen piloted the first orbital flight test of the shuttle Columbia (STS-1). Crippen was also the head of the Astronaut Office Ascent/Entry Group. He was commander of STS-7, STS 41-C and STS 41-G. He is currently Deputy Director of the Flight Crew Operations Directorate.

Frank L. Culbertson; Lieutenant, USN; born May 15, 1949, Charleston, South Carolina; married, three children.

Received bachelor of science in aerospace engineering from the U.S. Naval Academy (1971). In 1984, he was serving as a naval aviator at the Naval Air Station Oceana in Virginia, when he was selected as an astronaut candidate.

Ronnie Walter Cunningham; civilian; born March 16, 1932, Creston, Iowa; married, two children.

Flew as an aviator in the U.S. Marine Corps, received bachelor of arts degree in physics from the University of California at Los Angeles (1960), master of arts in physics from UCLA (1961), and was chosen with the third group of astronauts in 1963. He was lunar module pilot on Apollo 7. Mr. Cunningham resigned from NASA in August 1971 to become President of the HydroTech Development Company in Houston. He was Senior Vice-President/Director of Engineering, 3D International, Houston, Texas from December 1976 to October 1979. He is currently a partner with the Capital Group in Houston. His book, *The All-American Boys,* offers his views on the astronaut program.

Charles Moss Duke, Jr.; Brigadier General, UASFR; born October 3, 1935, Charlotte, North Carolina; married, two children.

Received bachelor of science from the U.S. Naval Academy (1957), master of science in aeronautics and astronautics from the Massachuetts Institute of Technology (1964), and was chosen with the fifth group of astronauts in 1966. He was backup lunar module pilot on Apollo 13, lunar module pilot for Apollo 16 (tenth man to walk on the Moon), and backup lunar module pilot for Apollo 17. He resigned from NASA and the Air Force (active duty) on January 1, 1976, to become a distributor for Coors Beer (the Orbit Corporation) in San Antonio, Texas. He resigned that position on March 31, 1978, to enter private business in San Antonio. He has since sold his business and currently devotes most of his time to speaking and counseling as a Christian Lay Minister. He has founded a non-profit corporation called the Duke Ministry for Christ.

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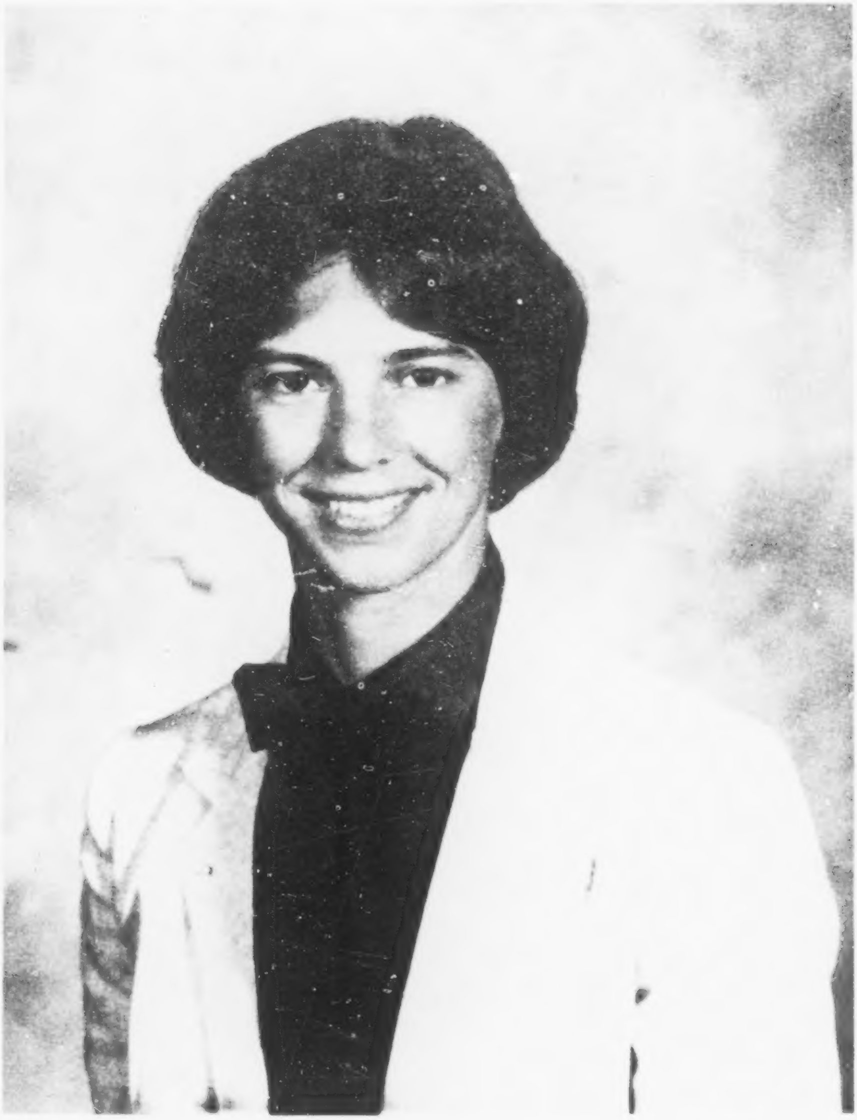
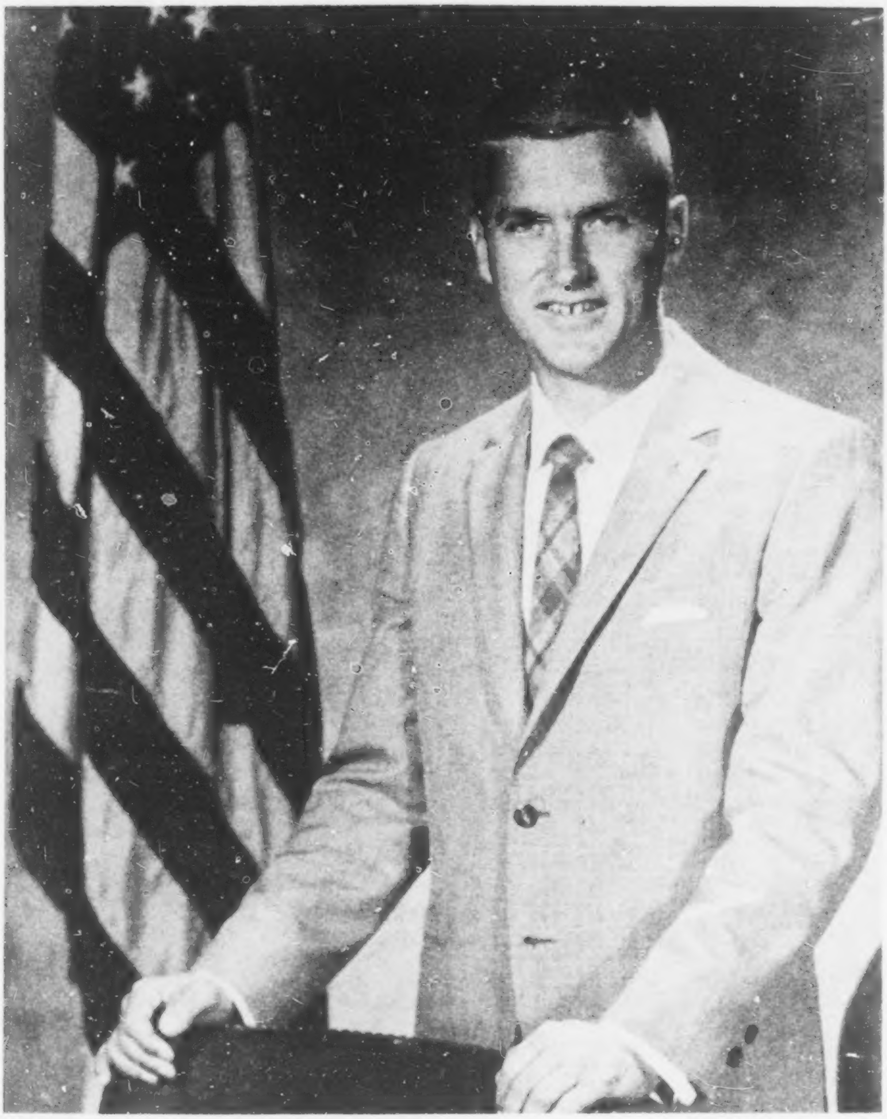


Bonnie Jeanne Dunbar; civilian; born March 3, 1949, Sunnyside, Washington; unmarried.

Received bachelor of science (1971) and master of science (1975) in ceramic engineering from the University of Washington. She has worked as a systems analyst for Boeing Computer Services, a research engineer at Rockwell International Space Division, a payload officer/flight controller at the Lyndon B. Johnson Space Center, and as a guidance and navigation officer/flight controller for the Skylab reentry mission in 1979. She was a project officer/payload officer for the space shuttle project and a doctoral candidate in biomedical engineering at the University of Houston when she was chosen as a mission specialist astronaut candidate in 1980. She is currently assigned as a mission specialist on STS 61-A.

Donn Fulton Eisele; Colonel, USAF (Retired); born June 23, 1930, Columbus, Ohio; married, five children (four by a previous marriage).

Received bachelor of science degree from the U.S. Naval Academy (1952), master of science in astronautics from the Air Force Institute of Technology (1960), and was chosen with the third group of astronauts in 1963. He was command module pilot of Apollo 7 and backup command module pilot for Apollo 10. Colonel Eisele left the astronaut corps in June 1970 to become Technical Assistant (Manned Flight) at NASA's Langley Research Center in Hampton, Virginia. He retired from NASA and the Air Force in July 1972 to become Peace Corps Director in Thailand. He is currently with the Oppenheimer Co., Inc. investment firm in Ft. Lauderdale, Florida.

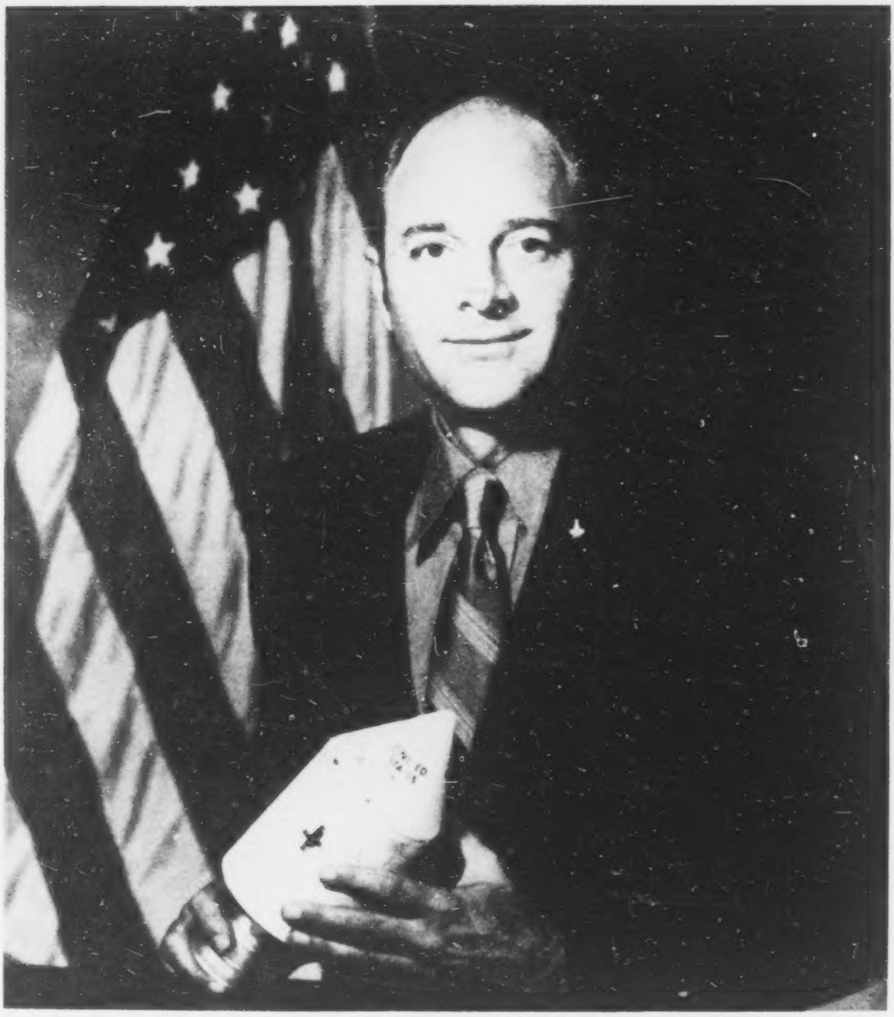


Anthony Wayne England; civilian, born May 15, 1942, Indianapolis, Indiana; married, two children.

Received bachelor and master of science degrees in geology and physics from the Massachusetts Institute of Technology (1965), doctorate in earth and planetary sciences from MIT (1970), and was chosen with the sixth group of astronauts in 1967. Dr. England was mission scientist for Apollo 16. He resigned from NASA in August 1972 and was a geophysicist with the U.S. Geological Survey, until June 1979 when he returned to NASA. He is now assigned to be a mission specialist on STS 51-F.

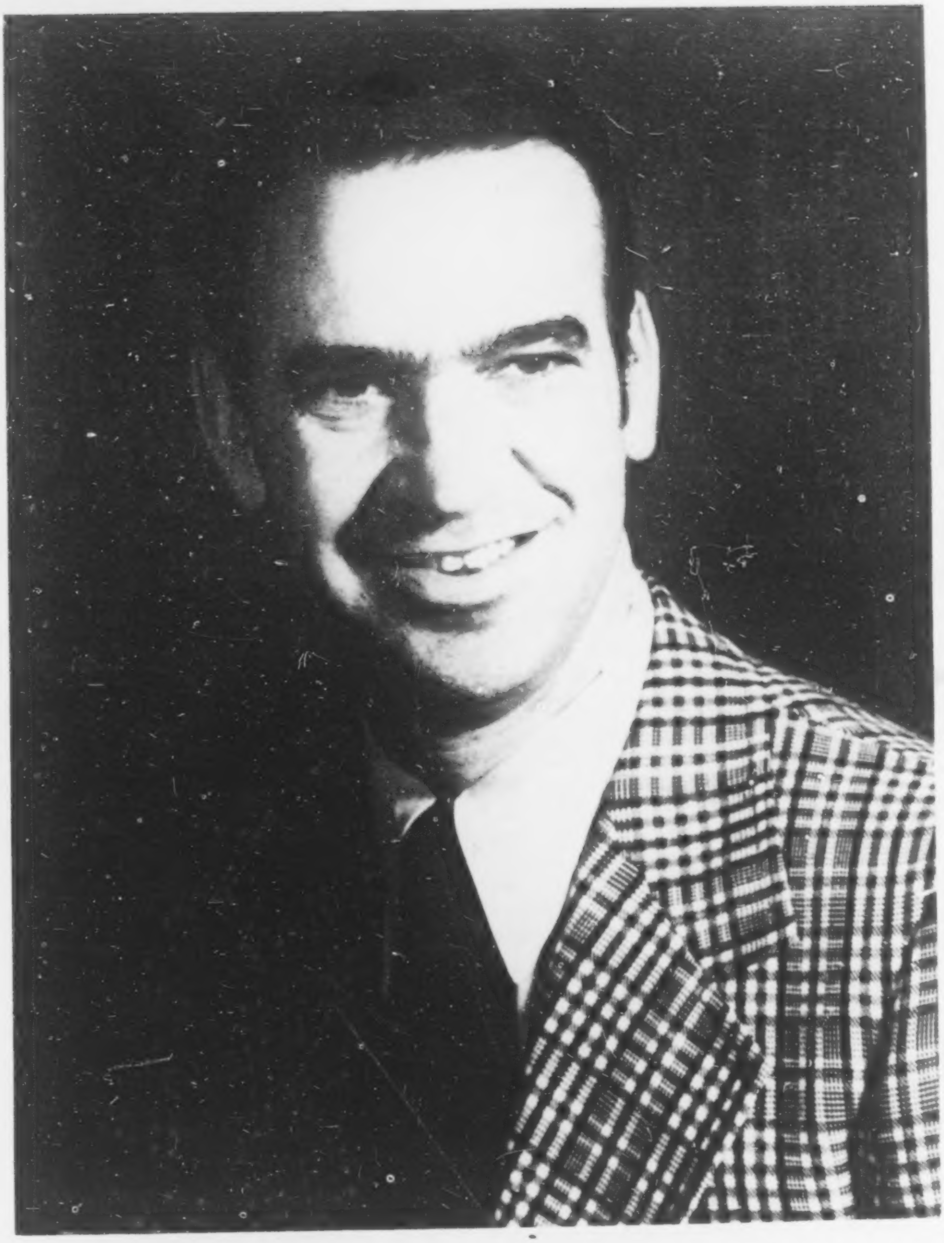
Joe Henry Engle; Colonel, USAF: born August 26, 1932, Abilene, Kansas, married, two children.

Received bachelor of science degree in aeronautical engineering from the University of Kansas (1955), was selected for the X-15 program (see chapter 3) in June 1963 and made a total of 16 X-15 flights reaching an altitude of 280,600 feet, thereby qualifying for the astronaut title, and was chosen as a NASA astronaut with the fifth group in 1966. He was backup lunar module pilot for Apollo 14 and commander of one of the two crews who flew shuttle approach and landing tests. Col. Engle was the backup commander for the first shuttle orbital flight test and was commander of the second orbital flight test of the shuttle. He served as Deputy Associate Administrator for Manned Space Flight at NASA Headquarters from March to December 1982. He is currently scheduled to be commander STS 51-I.



Ronald Ellwin Evans; Captain, USN (Retired); born November 10, 1933, St. Francis, Kansas; married, two children.

Received bachelor of science in electrical engineering from the University of Kansas (1956), master of science in aeronautical engineering from the U.S. Naval Postgraduate School (1964), and was chosen with the fifth group of astronauts in 1966. Captain Evans was backup command module pilot for Apollo 14, command module pilot for Apollo 17, and was backup command module pilot for the Apollo-Soyuz Test Project. He retired from the Navy on April 30, 1976, and from NASA on March 15, 1977. He was Executive Vice-President of Western America Energy Corporation in Scottsdale, Arizona until 1978 and in August 1978 he joined Sperry Flight Systems, Phoenix, Arizona where he is now Manager, Space Systems Marketing.

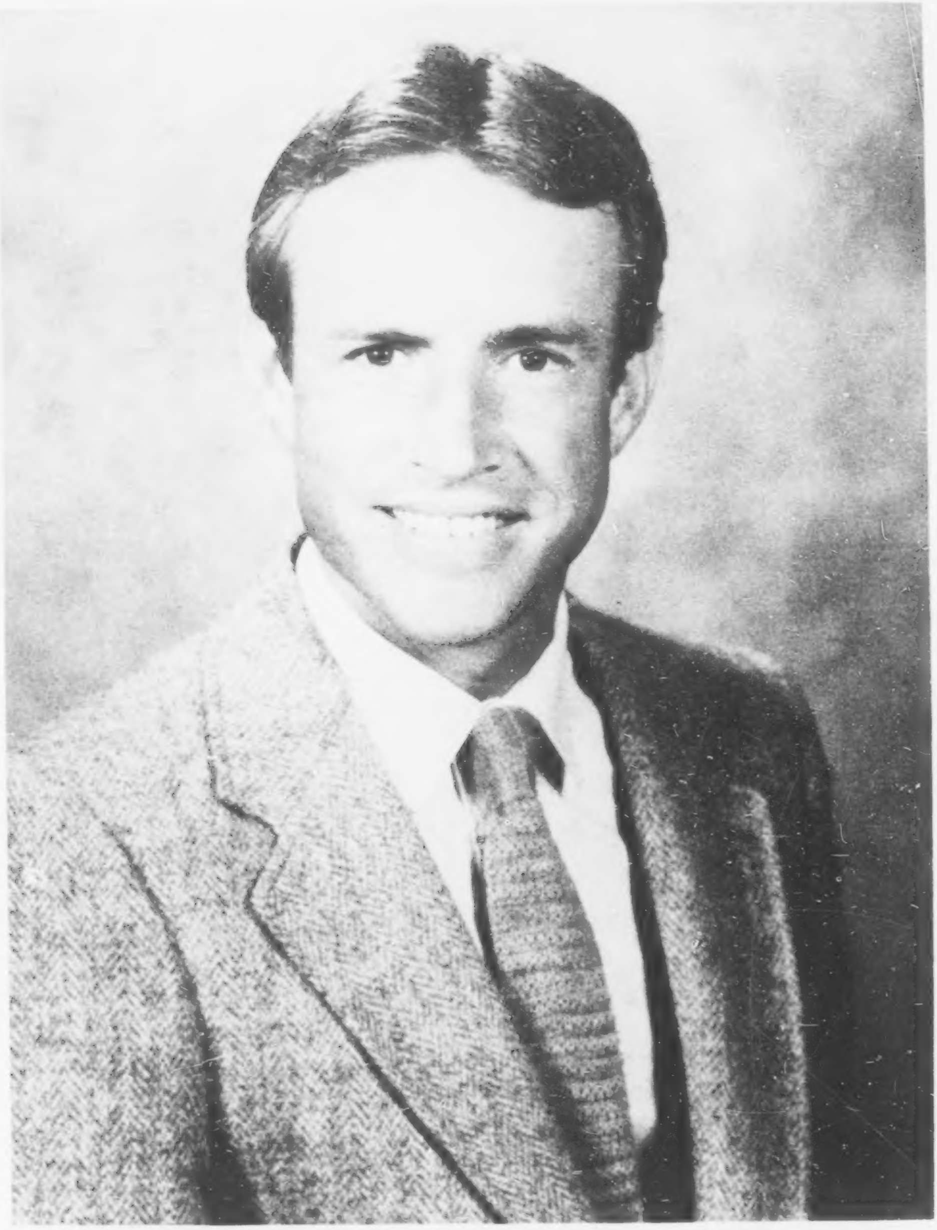


John McCreary Fabian; Colonel, USAF; born January 28, 1939, Goosecreek, Texas; married, two children.

Received bachelor of science in mechanical engineering from Washington State University (1962); master of science in aerospace engineering from the Air Force Institute of Technology (1964); doctorate in aeronautics/astronautics from the University of Washington (1974); and was assistant professor of aeronautics, U.S. Air Force Academy, Colorado when he was chosen with the eighth group of astronauts in 1978. He has been a mission specialist on STA-7 and on STS 51-G.

Anne Lee Fisher; civilian; born August 24, 1949, Albany, New York; married (to astronaut William Fisher), one child.

Received; bachelor of science in chemistry from the University of California, Los Angeles (1971), doctor of medicine from University of California, Los Angeles, School of Medicine (1976), and was chosen with the eighth group of astronauts in 1978. She was a mission specialist on STA 51-A.



William Frederick Fisher; civilian; born April 1, 1946, Dallas, Texas; married (to astronaut Anna Fisher), one child.

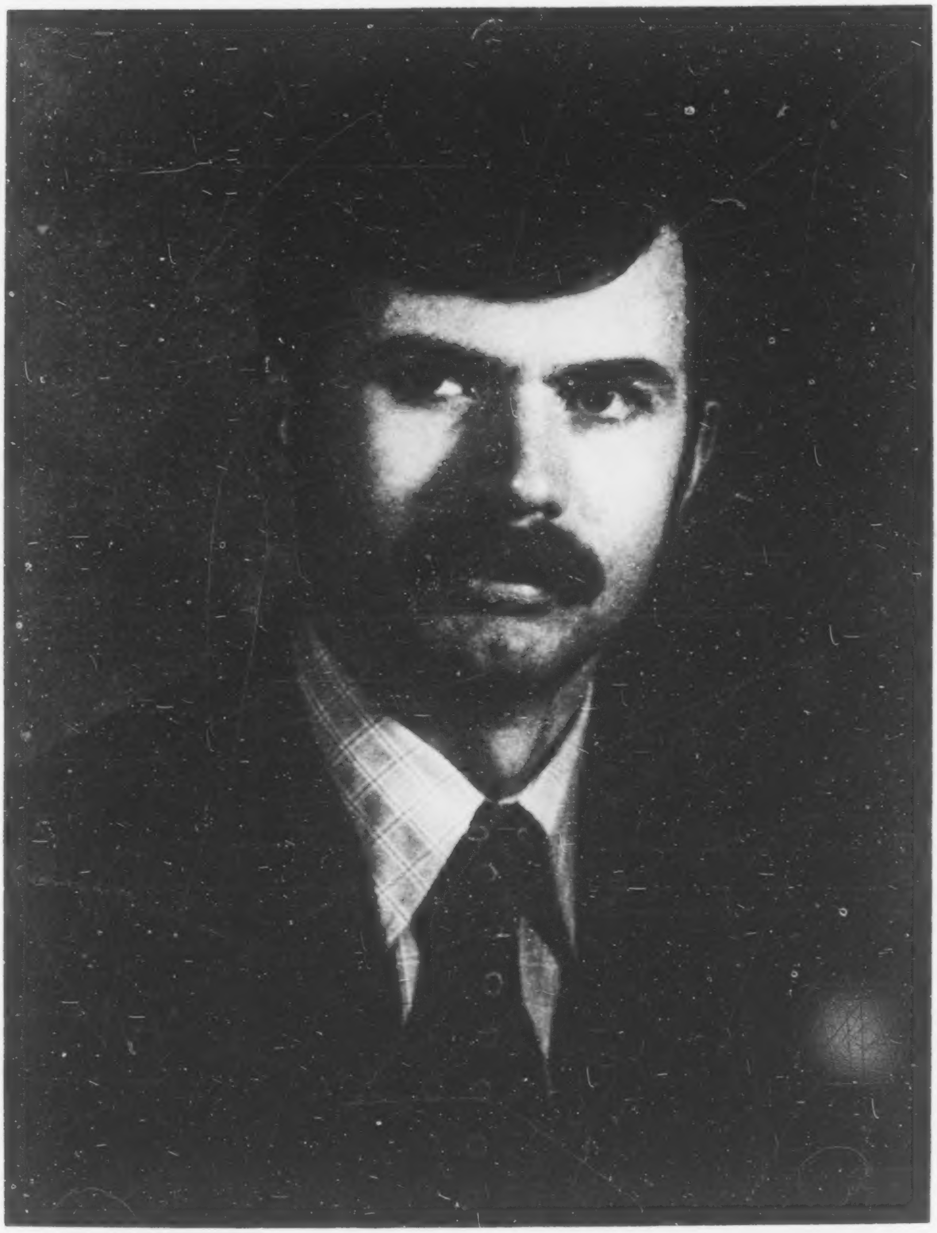
Received bachelor of arts in pre-med from Stanford University (1968); doctorate in medicine from the University of Florida (1975); and a master of science in engineering from the University of Houston (1980). He is a specialist in emergency medicine and was an instructor at the University of South Florida and at Northeast Regional Medical Center in Anniston, Alabama. He was chosen as a mission specialist astronaut candidate in 1980. He is currently practicing emergency medicine at Clear Lake Hospital, Houston, Texas, and is assigned as a mission specialist on STS 51–I.

Theodore Cordy Freeman; Captain, USAF; born February 18, 1930, Haverford, Pennsylvania; died October 31, 1964, in a T-38 crash at Ellington Air Force Base, Texas; was married, one child.

Received bachelor of science degree from the U.S. Naval Academy (1953), master of science in aeronautical engineering from the University of Michigan (1960), and was chosen with the third group of astronauts in 1963.

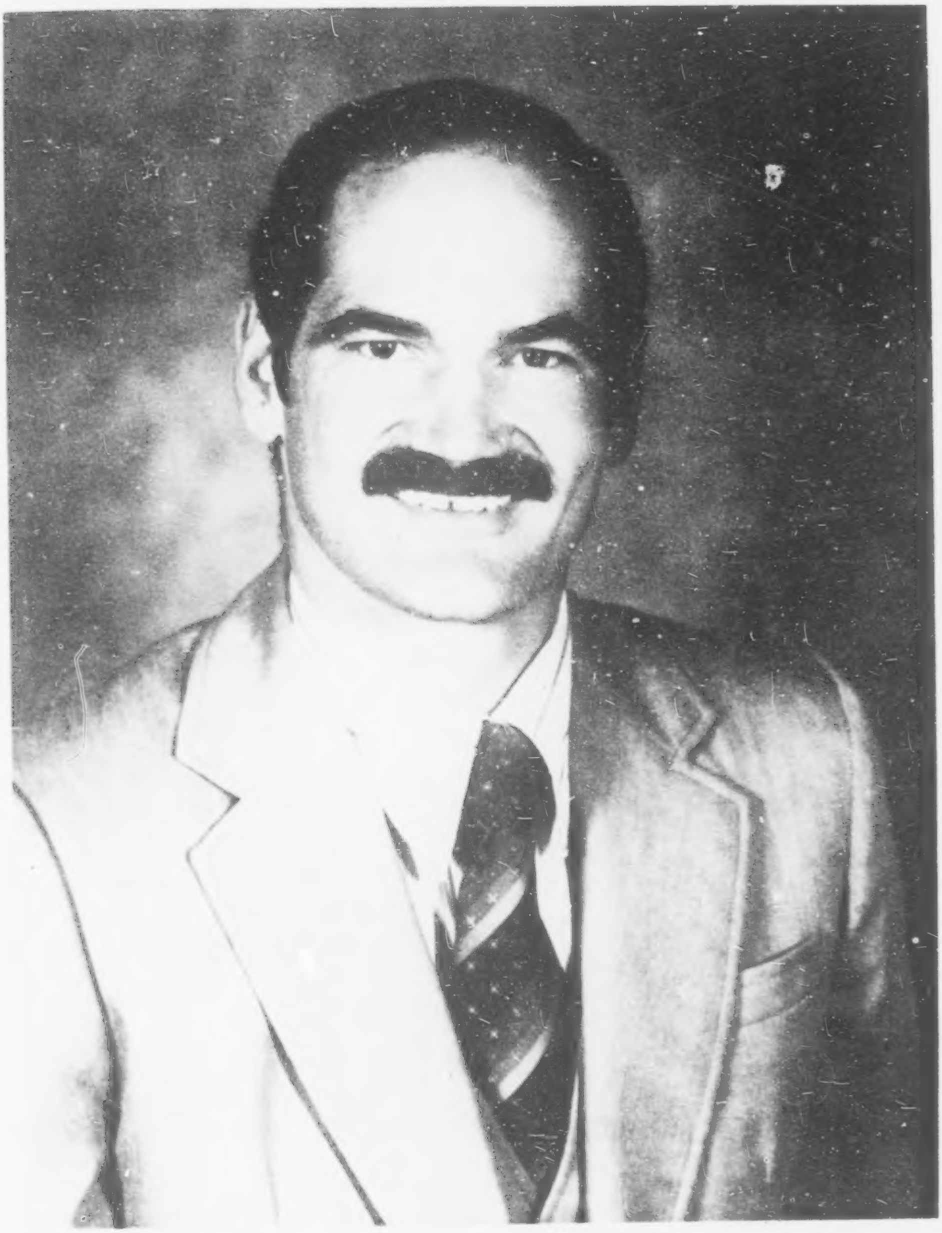
Charles Gordon Fullerton; Colonel, USAF; born October 11, 1936, Rochester, New York; married, two children.

Received bachelor of science in mechanical engineering from the California Institute of Technology (1957), master of science in mechanical engineering from CalTech (1958), was selected for the MOL program (see chapter 3) in 1966, and transferred to the NASA astronaut group in 1969. He was a member of one of the two-man crews who flew shuttle approach and landing tests, and was the pilot on the STS-3 mission. Fullerton has been chosen as commander of the STS 51-F mission.



Dale Allan Gardner; Commander, USN; born November 8, 1948, Fairmont, Minnesota; married, two children.

Received bachelor of science in engineering physics from the University of Illinois (1970), and was chosen with the eighth group of astronauts in 1978. He was a mission specialist for the STS-8 flight and STS 51-A, during which Gardner and Allen performed EVAs to retrieve two satellites.



Guy Spence Gardner; Lieutenant Colonel, USAF; born January 6, 1948, Alta Vista, Virginia; married, three children.

Received bachelor of science in engineering sciences from U.S. Air Force Academy (1969); and a master of science in aeronautics and astronautics from Purdue University (1970). Graduated from the USAF Test Pilot School at Edwards Air Force Base, California in 1975, served as a test pilot at Edwards, and as an instructor pilot at the USAF Test Pilot School. He was an operations officer with the 1st Test Squadron at Clark Air Base, Philippines, when chosen as a pilot astronaut candidate in 1980. Gardner is in training as pilot for STS 62-A, the first shuttle to be launched from Vandenberg Air Force Base, California.

Owen Kay Garriott; civilian; born November 22, 1930, Enid, Oklahoma; married, four children.

Received bachelor of science degree in electrical engineering from the University of Oklahoma (1953), master of science in electrical engineering from Stanford University (1957), doctorate in electrical engineering from Stanford (1960), and was chosen with the fourth group of astronauts in 1965. He was science pilot for Skylab 3, and a mission specialist on Spacelab 1 (STS 9). He is preparing for the flight of the Environmental Observation Mission and serving as a Program Scientist for the Space Station Program Office at Johnson Space Center.

Edward George Gibson; civilian; born November 8, 1936, Buffalo, New York; married; four children.

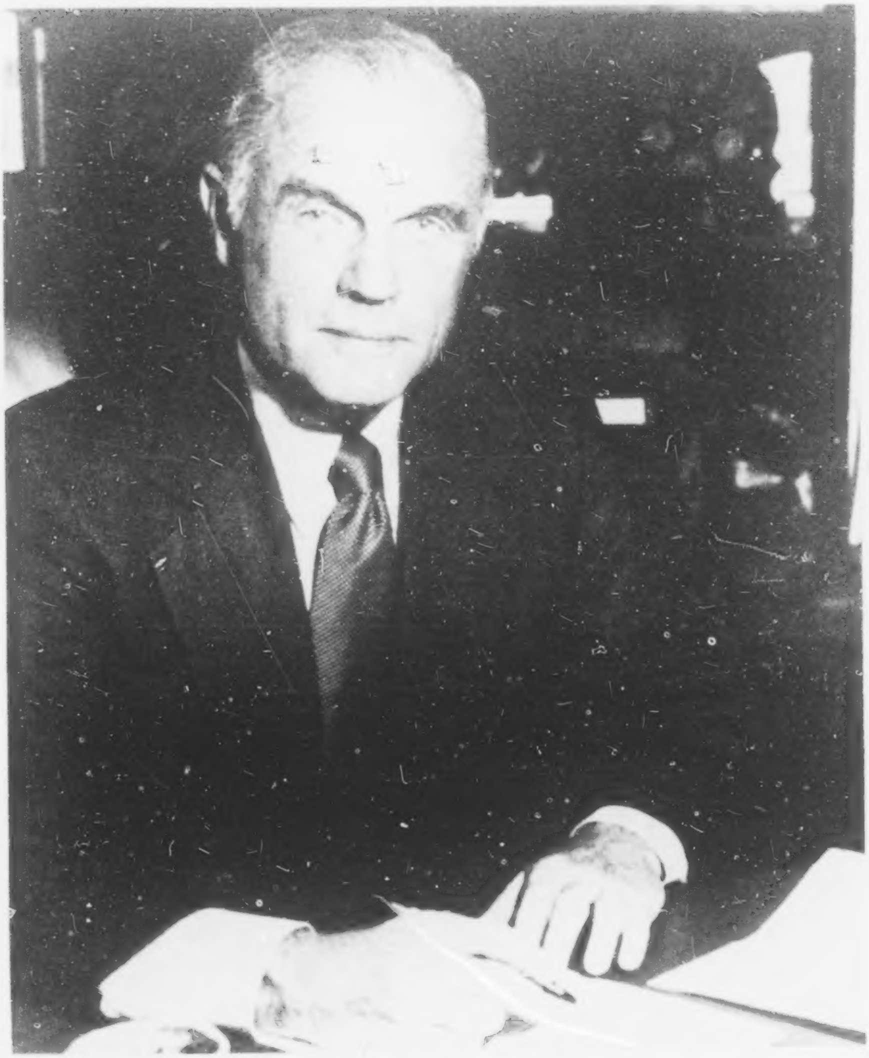
Received bachelor of science degree in engineering from the University of Rochester (1959), master of science in engineering from the California Institute of Technology (1960), doctorate in engineering from CalTech (1964), and was chosen with the fourth group of astronauts in 1965. He was science pilot for Skylab 4. Dr. Gibson resigned from NASA in November 1974 to join the Aerospace Corporation as senior staff scientist, specializing in the interpretation of solar data gathered during the Skylab program. He then became a senior consultant for Spacelab operations at VFW Fokker/ERNO in Europe. In March 1977, Dr. Gibson rejoined NASA, but resigned again in October 1980 to work for TRW, where he is currently an Advanced Systems Manager for the Major Programs Energy Development Group.

Robert Lee Gibson; Commander, USN; born October 30, 1946, Cooperstown, New York; married (to astronaut Rhea Seddon), two children (one by a previous marriage).

Received bachelor of science in aeronautical engineering from California Polytechnic State University (1969), and was chosen with the eighth group of astronauts in 1978. He was pilot on STS 41-B.

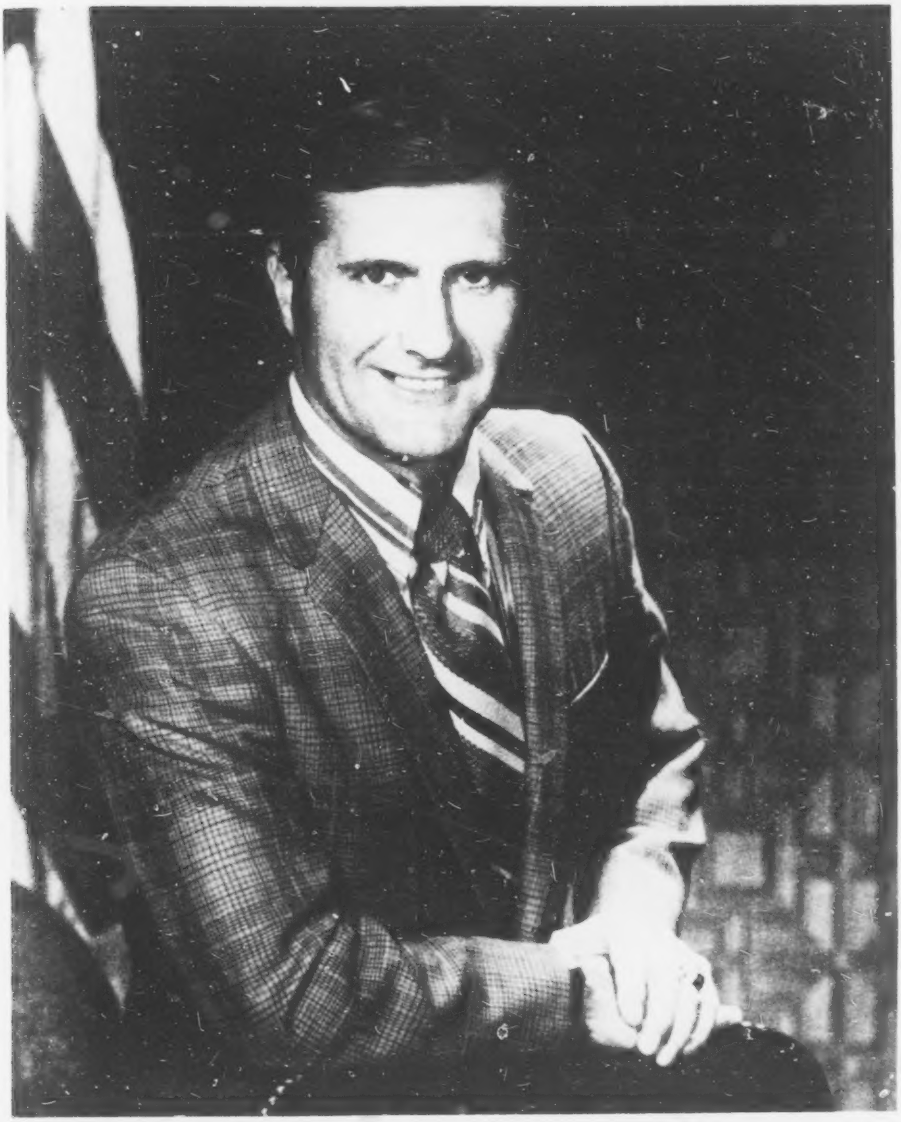
Edward Galen Givens, Jr.; Major, USAF; born January 5, 1930, Quanah, Texas; died June 6, 1967, in an automobile accident near Houston, Texas; was married, two children.

Received bachelor of science degree from the U.S. Naval Academy (1952) and was chosen with the fifth group of astronauts in 1966.



John Herschel Glenn, Jr.; Colonel, USMC (Retired); born July 18, 1921, Cambridge, Ohio; married, two children.

Attended Muskingum College, entered Naval Aviation Cadet Program (1942), commissioned in the Marine Corps (1943) and was chosen with the first group of astronauts in 1959. He was backup pilot for Mercury-Redstone 3 (Freedom 7) and Mercury-Redstone 4 (Liberty Bell 7), and was the first American to make an orbital flight, in Mercury-Atlas 6 (Friendship 7). He retired from NASA and the Marine Corps in 1964 to join the Royal Crown Cola Company, and to enter politics. He was elected U.S. Senator from the State of Ohio in November 1974 and was re-elected in November 1980.

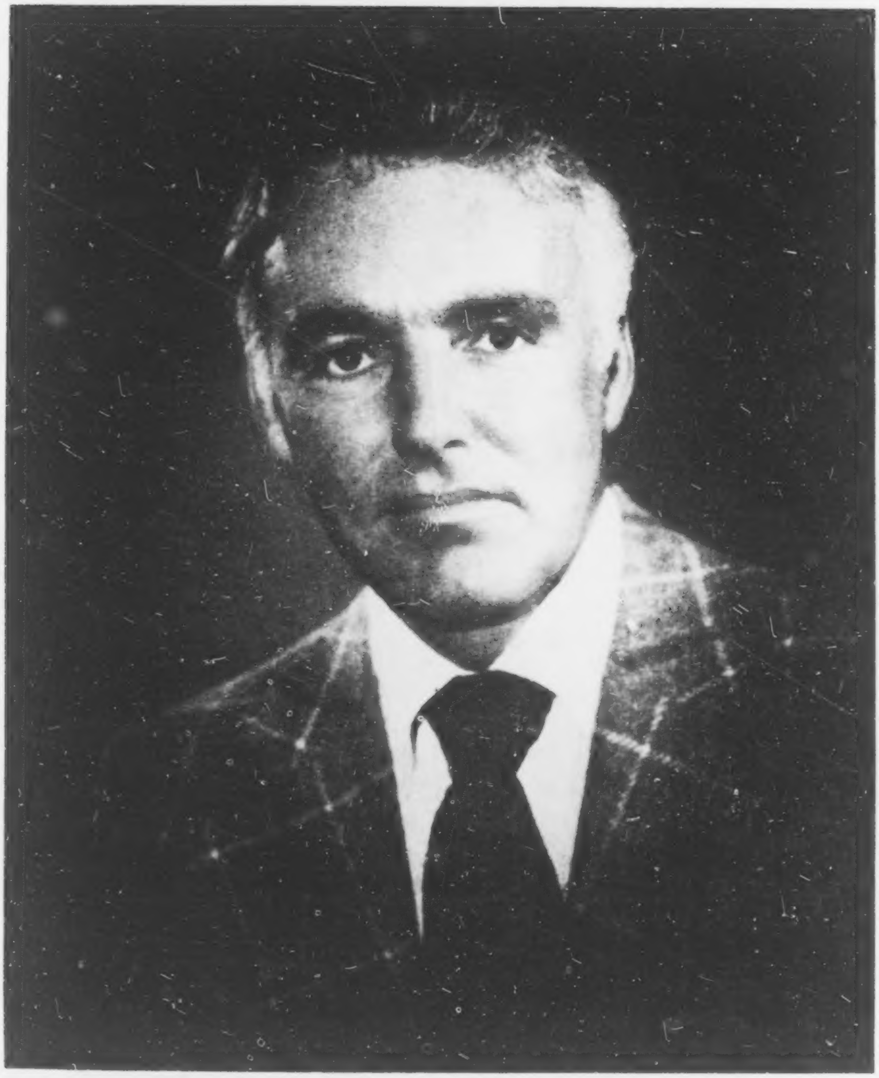


Richard Francis Gordon, Jr.; Captain, USN (Retired); born October 5, 1929, Seattle, Washington; married, six children.

Received bachelor of science in chemistry from the University of Washington (1951) and was chosen with the third group of astronauts in 1963. Captain Gordon was backup pilot for Gemini 8, pilot for Gemini 11, backup command module pilot for Apollo 9, command module pilot for Apollo 12, and backup commander for Apollo 15. He retired from NASA and the Navy on January 1, 1972, to become Executive Vice-President of the New Orleans Saints of the National Football League, a position he resigned on April 1, 1977. He was Vice-President, Operations, at Scott Science and Technology, Inc., and is currently working with Astro Systems and Engineering in Los Angeles.

Ronald John Grabe: Lieutenant Colonel, USAF; born June 13, 1945, New York, New York; married, two children.

Received bachelor of science in engineering science from U.S. Air Force Academy (1966); studied aeronautics as a Fulbright Scholar at the Technische Hochschule, Darmstadt, West Germany (1967). He was a pilot in Vietnam, graduated from the USAF Test Pilot School in 1975, was a test pilot at the Air Force Flight Test Center, and was an instructor at the USAF Test Pilot School at Edwards Air Force Base, California, when chosen as a pilot astronaut candidate in 1980. He served as Deputy Manager for Operations Integration, Space Shuttle Program Office, and is currently assigned as pilot for STS 51-J, the first flight of the fourth orbiter.

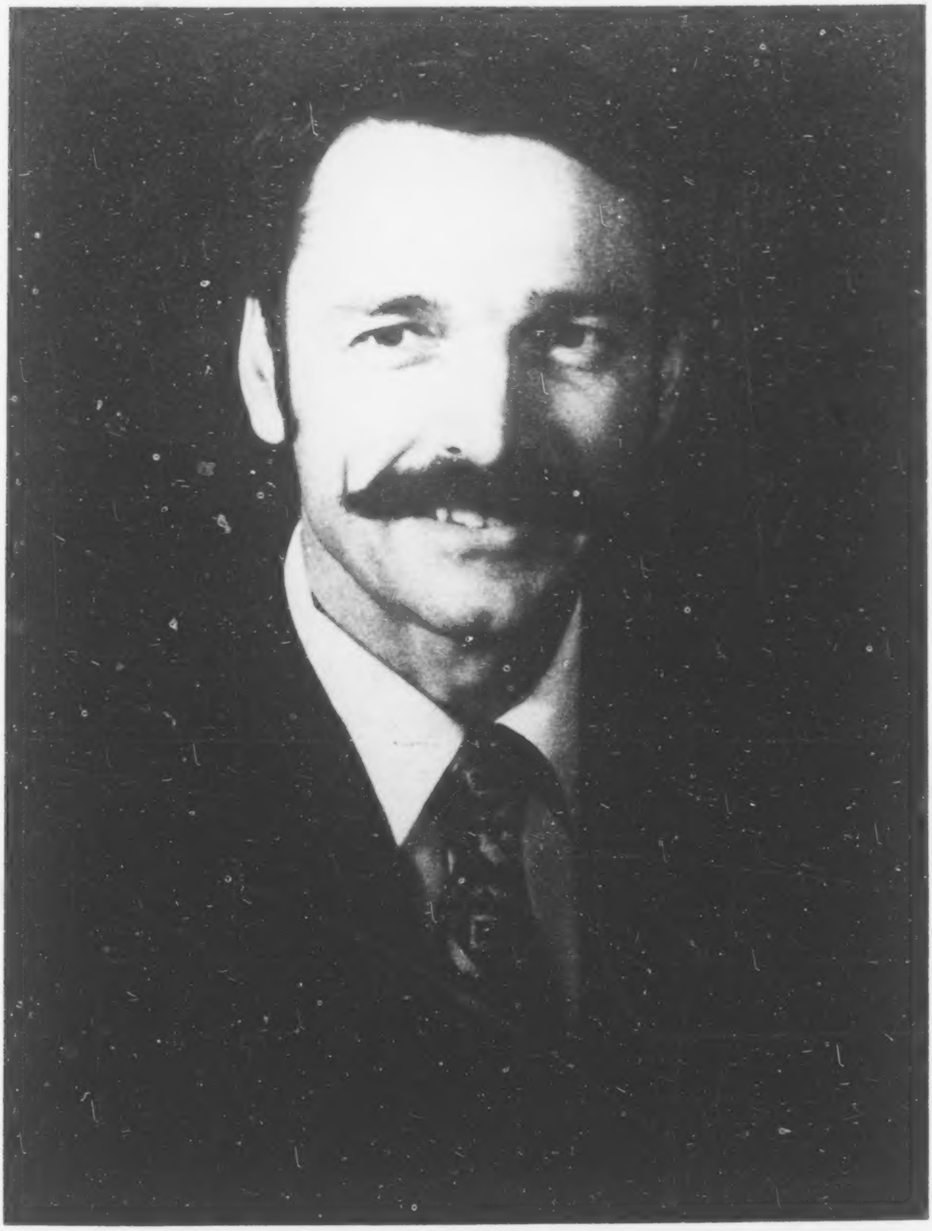


Duane Edgar Graveline; civilian; born March 2, 1931, Newport, Vermont; married, five children.

Received bachelor of science degree from the University of Vermont (1952), doctor of medicine degree from the University of Vermont Medical School (1955), master of science in public health from Johns Hopkins University (1958), served in the U.S. Air Force, and was chosen with the fourth group of astronauts in 1965. Dr. Graveline resigned from NASA in August 1965 for personal reasons and took a position with the State of Vermont Department of Health. He later resigned that position and set up his own practice, the Health Maintenance Center, in Colchester, Vermont.

Frederick Drew Gregory; Colonel, USAF; born January 7, 1941, Washington, D.C.; married, two children.

Received bachelor of science from U.S. Air Force Academy (1964); master of science in information systems from George Washington University (1977); and was chosen with the eighth group of astronauts in 1978. He was pilot on STS 51-B, the Spacelab 3 mission.



Stanley David Griggs; civilian; born September 7, 1939, Portland, Oregon; married, two children.

Received bachelor of science from U.S. Naval Academy (1962); served as a naval aviator; received master of science administration in management engineering from George Washington University (1970); and was Chief of the Shuttle Training Aircraft Operations Office, NASA/Johnson Space Center, Houston, Texas when he was chosen with the eighth group of astronauts in 1978. He is a captain in the naval air reserve. He was a mission specialist on STS 51-D, during which he and Hoffman performed an unscheduled EVA.

Virgil "Gus" Ivan Grissom; Lieutenant Colonel, USAF; born April 3, 1926, Mitchell, Indiana; died January 27, 1967, in the Apollo 204 fire at Cape Kennedy, Florida; was married, two children.

Received bachelor of science in mechanical engineering from Purdue University (1950) and was chosen with the first group of astronauts in 1959. He was pilot for Mercury-Redstone 4 (Liberty Bell 7), command pilot for Gemini 3, backup command pilot for Gemini 6, and had been selected as commander of the first manned Apollo flight.

Sidney M. Gutierrez; Captain, USAF; born June 27, 1951, Albuquerque, New Mexico; married, two children.

Received bachelor of science in aeronautical engineering, U.S. Air Force Academy (1973), and master of arts in management, Webster College (1977). He attended Test Pilot School in 1981. Gutierrez was selected as an astronaut candidate in May 1984 and, in May 1985, became eligible for future shuttle mission assignment.

Fred Wallace Haise, Jr.; civilian; born November 14, 1933, Biloxi, Mississippi; married, four children.

Received bachelor of science degree in aeronautical engineering from the University of Oklahoma (1959), served as an aviator in both the U.S. Marine Corps and the U.S. Air Force, and was chosen in the fifth group of astronauts in 1966. Mr. Haise was backup lunar module pilot for Apollo 8 and Apollo 11, lunar module pilot for Apollo 13, and backup commander for Apollo 16. He was commander of one of the two crews who flew shuttle approach and landing tests, and had been selected as commander of one of the four shuttle orbital flight tests but he resigned from NASA on June 29, 1979 and is currently President, Grumman Technical Services, Inc.

L. Blaine Hammond, Jr.; USN; born January 16, 1952, Savannah, Georgia; single.

Received bachelor of science, U.S. Air Force Academy (1973) and master of science in engineering mechanics, Georgia Institute of Technology (1974). He was a test pilot instructor for the Air Force when he was selected as an astronaut candidate in May 1984.

Terry Jonathan Hart; civilian; born October 27, 1946, Pittsburgh, Pennsylvania; married, one child.

Received bachelor of science in mechanical engineering from Lehigh University (1968); master of science in mechanical engineering from Massachusetts Institute of Technology (1969); master of science in electrical engineering Rutgers University (1978); served in the USAF as an aviator; and was chosen with the eighth group of astronauts in 1978. He flew as a mission specialist on STS 41-C. Hart resigned from NASA in June 1984 and is currently a supervisor for the Military and Space Application Group at AT&T Bell Labs.

Henry Warren Hartsfield, Jr.; Colonel, USAF (Retired); born November 21, 1933, Birmingham, Alabama; married, two children.

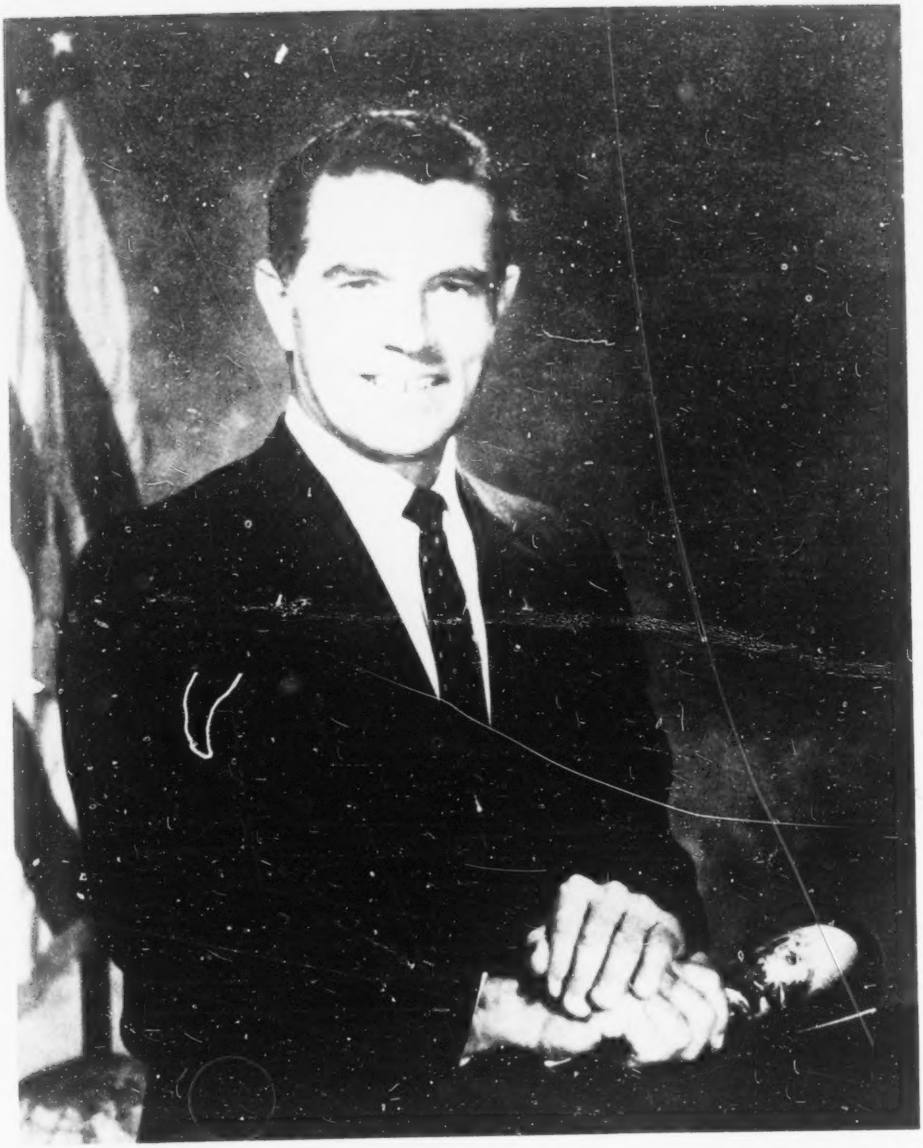
Received bachelor of science degree in physics from Auburn University (1954), master of science in engineering science from the University of Tennessee (1971), was selected for the MOL program (see Chapter 3) in 1966 and was transferred to the NASA astronaut group in 1969. Col. Hartsfield was a member of the support crew for Skylab 2, 3, and 4. He retired from the Air Force on Aug. 31, 1977. He served as a backup pilot for STS and STS-3 and was a pilot for the STS-4 flight and commander of STS 41-D.

Frederick Hamilton Hauck; Commander, USN; born April 11, 1941, Long Beach, California; married, two children.

Received bachelor of science in general physics from Tufts University (1962); master of science in nuclear engineering from Massachusetts Institute of Technology (1966); and was chosen with the eighth group of astronauts in 1978. He was pilot for the STS-7 flight and commander of STS 51-A. He is currently assigned to be commander of STS 61-A.

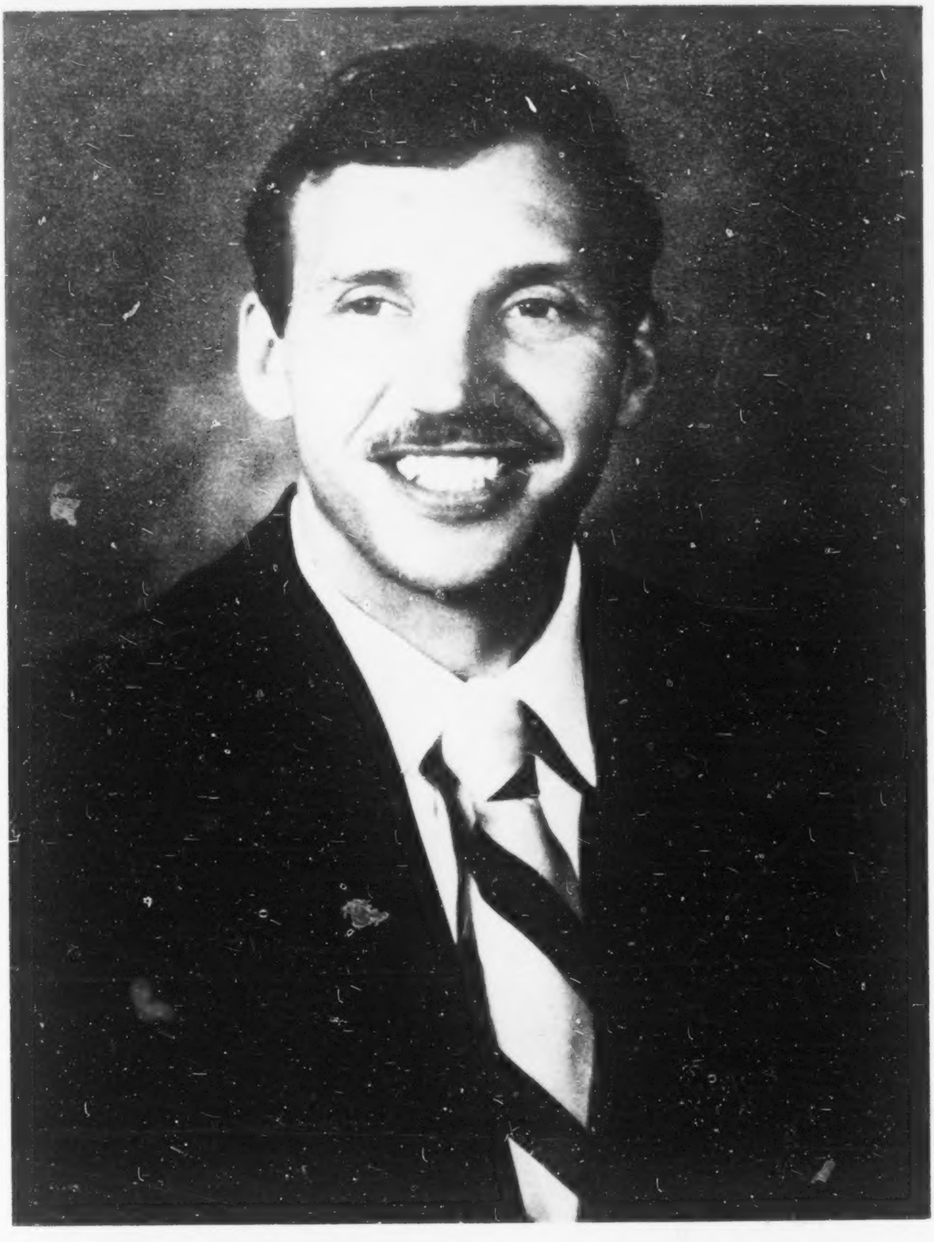
Steven Alan Hawley; civilian; born December 12, 1951, Ottawa, Kansas; married (to astronaut Sally Ride), no children.

Received bachelor of arts in astronomy and physics from the University of Kansas (1973); doctorate in astronomy from the University of California, Santa Cruz (1977); and was chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 41-D. He is currently Technical Assistant to the Director of Flight Crew Operations, and is assigned as a mission specialist on STS 61-C.



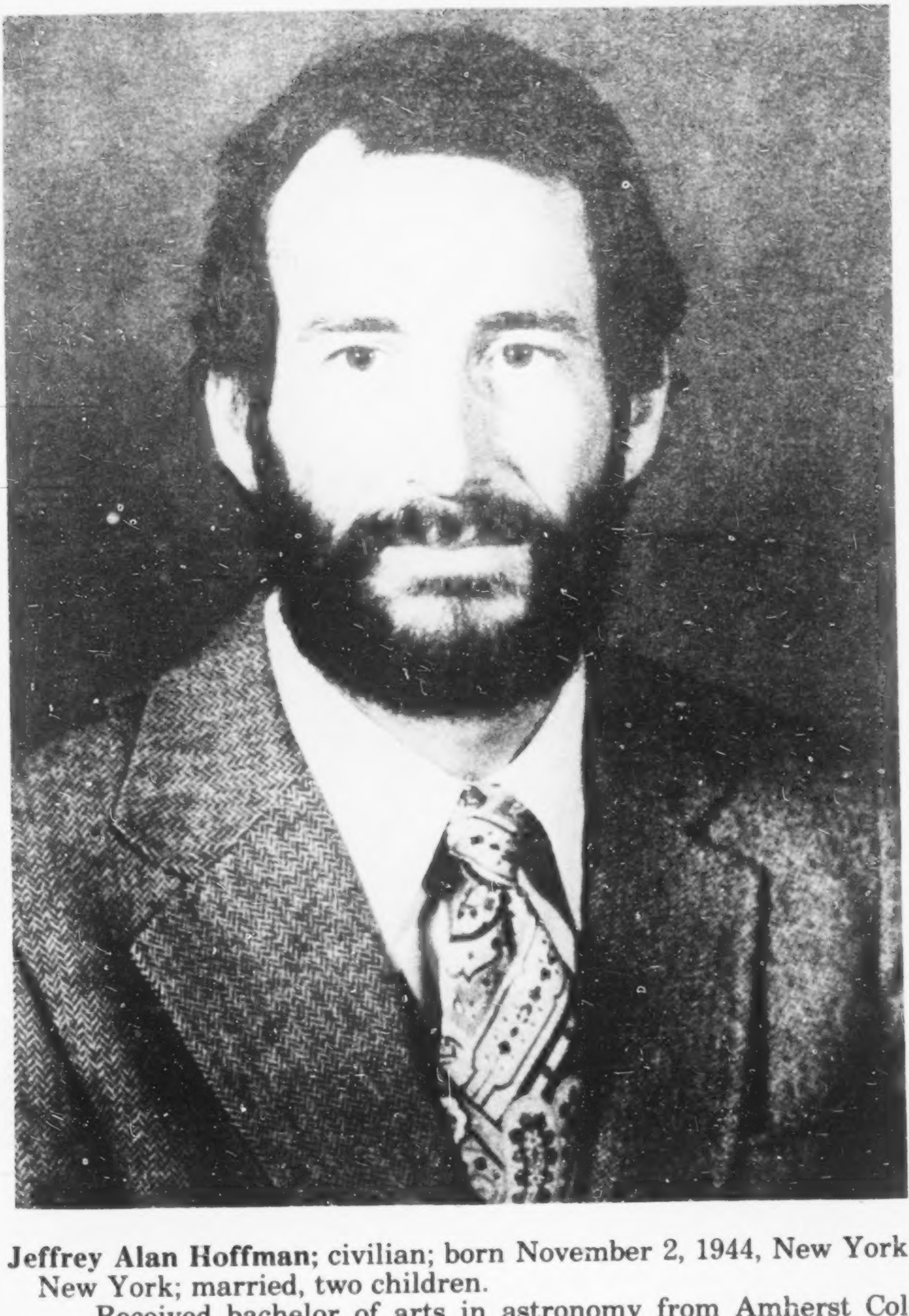
Karl Gordon Henize; civilian; born October 17, 1926, Cincinnati, Ohio; married, four children.

Received bachelor of arts degree in math from the University of Virginia (1947), master of arts in astronomy from the University of Virginia (1948), doctorate in astronomy from the University of Michigan (1954), served in the U.S. Naval Reserve, and was chosen in the sixth group of astronauts in 1967. He was a principal investigator for ultraviolet astronomy experiments for the Skylab program, a member of the support crew for Skylab, 2, 3, and 4, and is currently assigned to be a mission specialist on Spacelab 2 (STS 51-F) scheduled for August 1985.



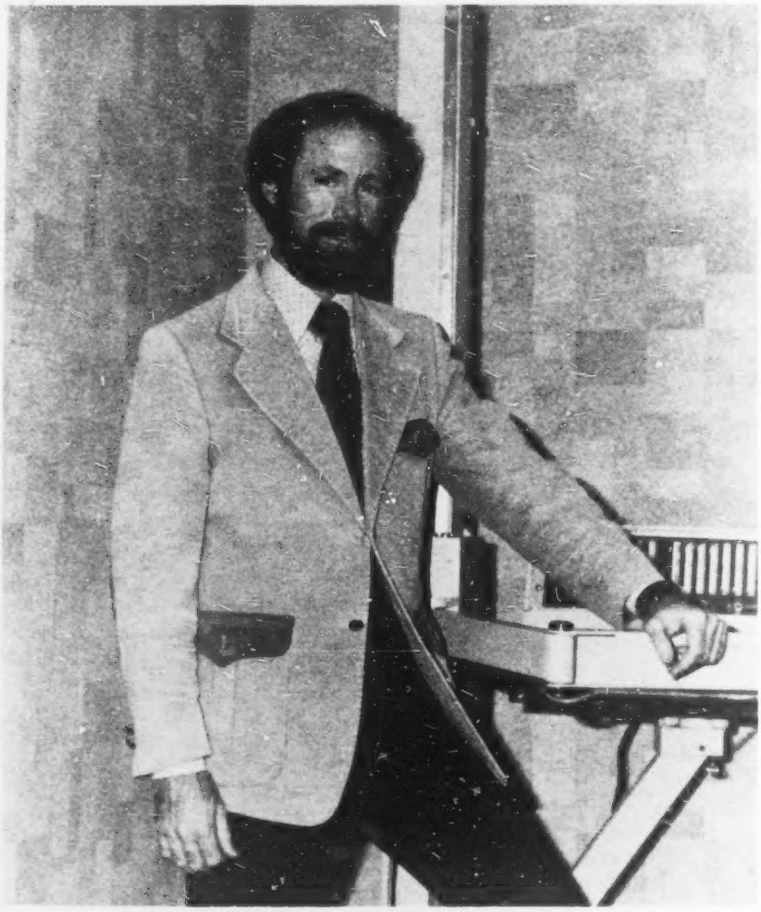
David Carl Hilmers; Major, USMC; born January 28, 1950, Clinton, Iowa; married, two children.

Received bachelor of science in mathematics from Cornell College (1972); master of science in electrical engineering and the degree of electrical engineer from the U.S. Naval Postgraduate School (1978). He is currently assigned as a mission specialist on STS 51-J.



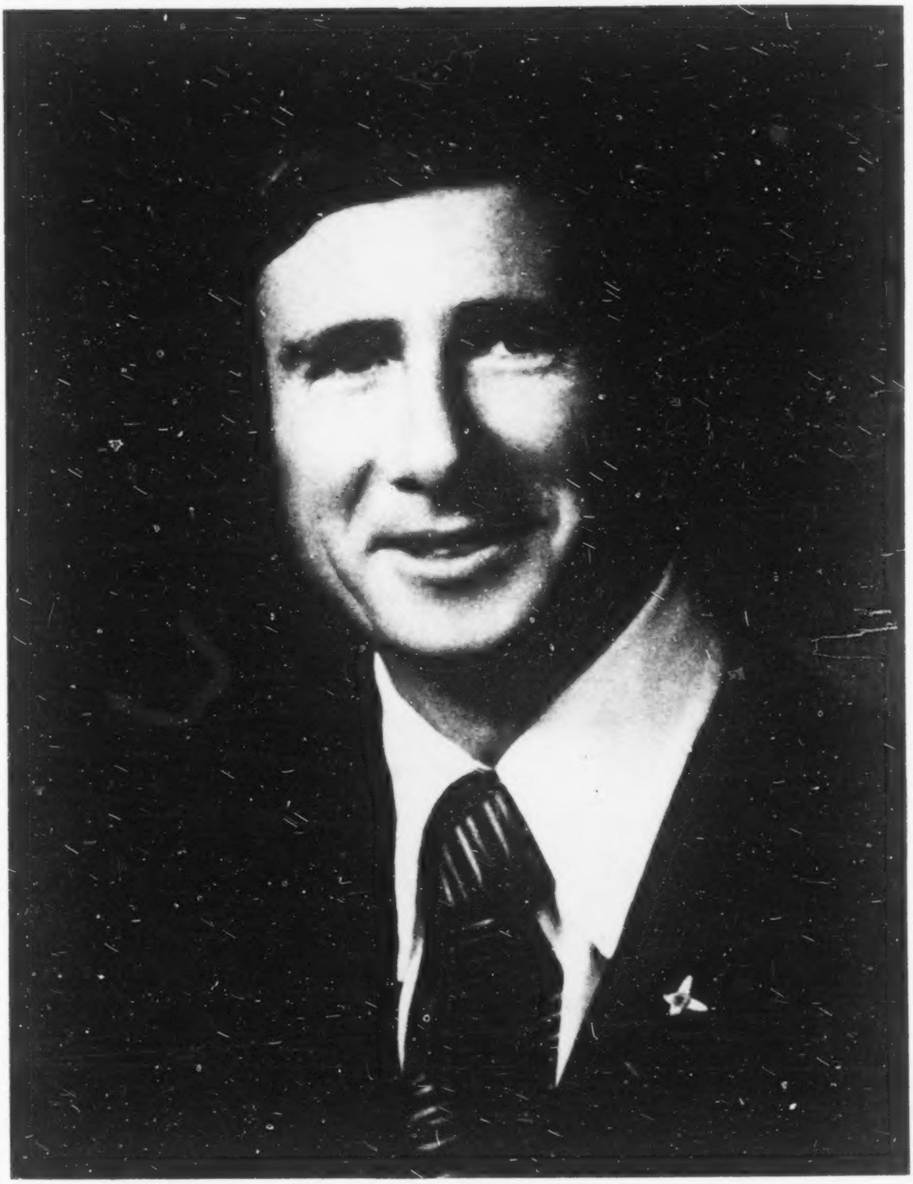
Jeffrey Alan Hoffman; civilian; born November 2, 1944, New York, New York; married, two children.

Received bachelor of arts in astronomy from Amherst College (1966); doctorate in astrophysics from Harvard University (1971); and was chosen with the eighth group of astronauts in 1978. He flew as a mission specialist on STS 51-D, and, with Griggs, made an unscheduled space walk.



Donald Lee Holmquest; civilian; born April 7, 1939, Dallas, Texas; married, one child (by a previous marriage).

Received bachelor of science in electrical engineering from Southern Methodist University (1962), doctor of medicine degree from Baylor University College of Medicine (1967), doctorate in physiology from Baylor (1968), and was chosen in the sixth group of astronauts in 1967. Dr. Holmquest took a leave of absence in May 1971 to hold the position of assistant professor of radiology and physiology at Baylor College of Medicine. He resigned from NASA in September 1973 to become Associate Dean of the Medical School at Texas A&M University. He is currently the head of the Nuclear Medicine Department, Navasota Medical Center, Navasota, Texas.



James Benson Irwin; Colonel, USAF (Retired); born March 17, 1930, Pittsburgh, Pennsylvania; married, four children.

Received bachelor of science from the U.S. Naval Academy (1951), master of science in aeronautical and instrumentation engineering from the University of Michigan (1957), and was chosen with the fifth group of astronauts in 1966. He was backup lunar module pilot for Apollo 12 and lunar module pilot for Apollo 15 (eighth man to walk on the Moon). Colonel Irwin resigned from NASA and the Air Force in July 1972 to form a religious organization, High Flight Foundation, in Colorado Springs, Colorado, of which he is Chairman of the Board. His book, *To Rule the Night,* describes his early life, selection into the astronaut program, and his experiences on Apollo 15.

Marsha S. Ivins; civilian; born April 15, 1951, Baltimore, Maryland; single.

Received bachelor of science in aerospace engineering from University of Colorado (1973). She has been employed at Johnson Space Center since 1974 as an engineer and since 1980 has worked on flight simulation. Ivins was selected in the May 1984 astronaut class, and is currently eligible for flight assignment as a mission specialist.

Joseph Peter Kerwin; Captain, USN; born February 19, 1932, Oak Park, Illinois; married, three children.

Received bachelor of arts degree in philosophy from the College of the Holy Cross (1953), doctor of medicine from Northwestern University Medical School (1957), and was chosen with the fourth group of astronauts in 1965. He was the science pilot for Skylab 2, and was subsequently in charge of the on-orbit branch of the Astronaut Office. From April 1982 to December 1983, Dr. Kerwin served as NASA's senior scientific representative in Australia. He is currently Director, Space and Life Sciences at Johnson Space Center.

Mark C. Lee; Captain, USAF; born August 14, 1952, Viroqua, Virginia; married.

Received bachelor of science in civil engineering, U.S. Air Force Academy (1974) and master of science in mechanical engineering, Massachusetts Institute of Technology (1980). He was serving as an F-16 pilot and Flight Commander, 4th Tactical Fighter Squadron, Hill Air Force Base, Utah when selected in the 1984 astronaut class. Lee is currently eligible for shuttle flight assignment as a mission specialist.

David Cornell Leestma; Commander, USN; born May 6, 1949, Muskegon, Michigan; married, three children.

Received bachelor of science in aeronautical engineering from U.S. Naval Academy (1971); and a master of science in aeronautical engineering from U.S. Naval Postgraduate School (1972). He has made three overseas deployments flying aboard the U.S.S. *John F. Kennedy;* and was operational test director of F-14 software at Naval Air Station, Point Mugu, California. He was selected as an astronaut candidate in 1980 and served as a mission specialist on STS 41-G, during which he conducted an EVA.

William Benjamin Lenoir; civilian; born March 14, 1939, Miami, Florida; married, two children.

Received bachelor of science degree in electrical engineering from the Massachusetts Institute of Technology (1961), master of science in electrical engineering from MIT (1962), doctorate in electrical engineering from MIT (1965), and was chosen with the sixth group of astronauts in 1967. He was backup science pilot for Skylab 3 and Skylab 4, and was a mission specialist on the STS-5 flight. In September 1984, Lenoir resigned from NASA to work at Booz-Allen and Hamilton, working in space systems development and commercialization of space.

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Don Leslie Lind; civilian; born May 18, 1930; Midvale, Utah; married, seven children.

Received bachelor of science in physics from the University of Utah (1953), served as an aviator in the U.S. Naval Reserve, received doctorate in high energy physics from the University of California at Berkeley (1964), and was chosen with the fifth group of astronauts in 1966. He was backup pilot for Skylab 3 and Skylab 4, and flew as a mission specialist on Spacelab 3 (STS 51-B).

John Anthony Llewellyn; civilian; born April 22, 1933, Cardiff, Wales; became U.S. citizen February 17, 1966; married, three children.

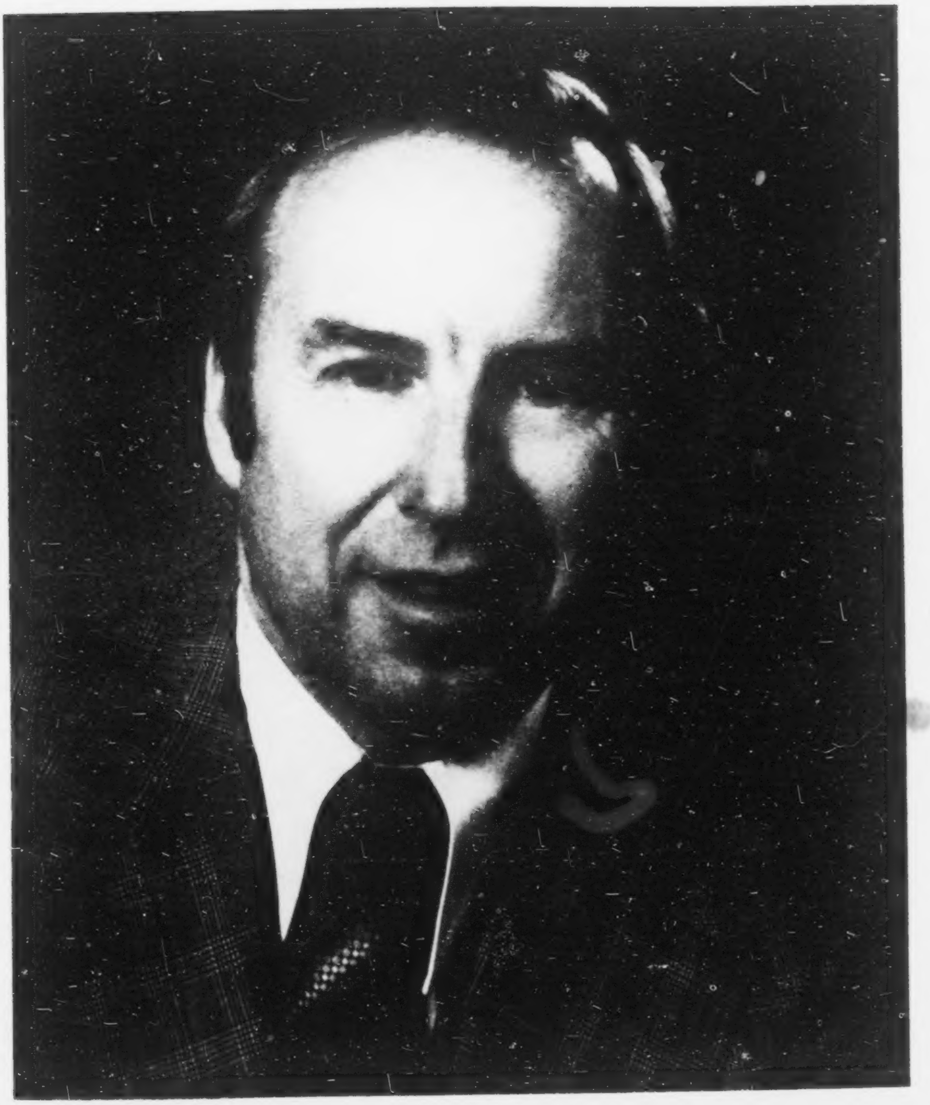
Received bachelor of science from University College, Cardiff, Wales (1955), and a doctorate in chemistry from University College (1958), and was chosen with the sixth group of astronauts in 1967. He withdrew from the program on September 6, 1968, for personal reasons and presently is a professor in the Department of Energy Conversion and Mechanical Design, College of Engineering, University of South Florida.

John Michael Lounge; civilian; born June 28, 1946, Denver, Colorado; married; three children (one by a previous marriage).

Received bachelor of science in physics and mathematics from U.S. Naval Academy (1969); and a master of science in astrogeophysics from the University of Colorado (1970). He completed one combat tour aboard the U.S.S. *Enterprise* in Southeast Asia; was an instructor in the Physics Department, U.S. Naval Academy; worked in the Navy Space Project Office, Washington, D.C.; and from 1978 to 1980 worked as an engineer in the Payloads Operations Division at the Lyndon B. Johnson Space Center. He is working on an advanced degree in human factors engineering at the University of Houston and was selected as a mission specialist astronaut candidate in 1980. During 1980 he served as a member of the launch support team at KSC for the STS–1 and STS–2 missions, and is assigned to the STS 51–I flight.

Jack Robert Lousma; Colonel, USMC (Retired); born February 29, 1936, Grand Rapids, Michigan; married, three children.

Received bachelor of science in aeronautical engineering from the University of Michigan (1959), degree of aeronautical engineering from the U.S. Naval Postgraduate School (1965), and was chosen with the fifth group of astronauts in 1966. He was pilot for Skylab 3, and backup docking module pilot for the Apollo-Soyuz Test Project, and the commander of the STS-3 flight. Lousma retired from NASA in September 1983 and ran for the Senate in Michigan in 1984. He is currently a consultant in Ann Arbor, Michigan.

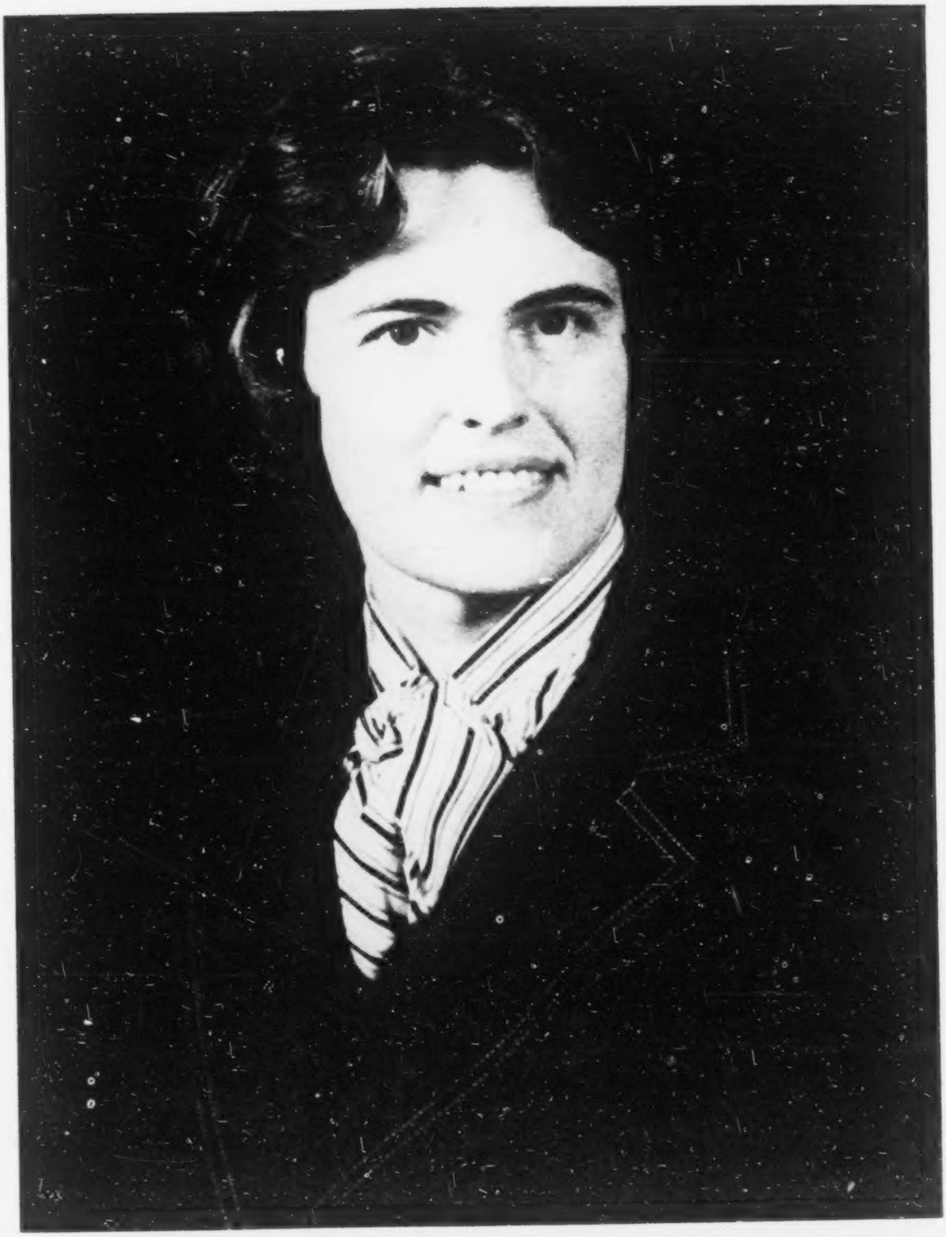


James Arthur Lovell, Jr.; Captain, USN (Retired); born March 25, 1928, Cleveland, Ohio; married, four children.

Received bachelor of science from the U.S. Naval Academy (1952) and chosen with the second group of astronauts in 1962. He was backup pilot for Gemini 4, pilot of Gemini 7, backup command pilot for Gemini 9, command pilot for Gemini 12, command module pilot of Apollo 8, backup commander for Apollo 11, and commander of Apollo 13. In May 1971 he became Deputy Director of Science and Applications at the Johnson Space Center. Captain Lovell retired form NASA and the Navy in March 1973 to become President and Chief Executive Officer of the Bay-Houston Towing Company in Houston. He resigned that position on January 1, 1977, to become President of Fisk Telephone Systems in Houston. On January 1, 1981 he became Group Vice President of Centel Corporation, the parent company of Fisk Telephone System. He has since been promoted to the position of Executive Vice President.

G. David Low; civilian; born February 19, 1956, Cleveland, Ohio; single.

Received bachelor of science in physics-engineering, Washington & Lee University (1978), bachelor of science in mechanical engineering, Cornell University (1980), and master of science in aeronautics and astronautics, Stanford University (1983). He worked at Jet Propulsion Laboratory from 1980 to June 1984, working on several planetary missions including the Galileo spacecraft and was principle spacecraft engineer for the Mars Geoscience/Climatology Observer Project. He was selected in the 1984 astronaut class and is eligible for assignment to future shuttle missions.



Shannon Wells Lucid; civilian; born January 14, 1943, Shanghai, China; married, three children.

Received bachelor of science in chemistry from the University of Oklahoma (1963); master of science (1970) and doctorate (1978) in biochemistry from the University of Oklahoma; and was chosen with the eighth group of astronauts in 1978. She was a mission specialist on STS 51-G.

Thomas Kenneth Mattingly II; Commodore, USN; born March 17, 1936, Chicago, Illinois; unmarried, one child (by a previous marriage).

Received bachelor of science in aeronautical engineering from Auburn University (1958), and was chosen with the fifth group of astronauts in 1966. He was scheduled to be command module pilot on Apollo 13 but was replaced by his back-up 72 hours before launch when it was discovered he had been exposed to measles, and was command module pilot for Apollo 16. From December 1979 to April 1981, he headed the astronaut office ascent/entry group. Mattingly subsequently served as backup commander for space shuttle flights 2 and 3 and was spacecraft commander for STS-4 and STS 51-C. He is currently Director, Space Program of the Space and Naval Warfare Systems Command.

Jon Andrew McBride; Commander, USN; born August 14, 1943, Charleston, West Virginia; married, three children.

Received bachelor of science in aeronautical engineering from the U.S. Navy Postgraduate School (1971), and was chosen with the eighth group of astronauts in 1978. He was pilot of STS 41-G.

Bruce McCandless II; Captain, USN; born June 8, 1937, Boston, Massachusetts; married, two children.

Received bachelor of science from the U.S. Naval Academy (1958), master of science in electrical engineering from Stanford University (1965), and was chosen with the fifth group of astronauts in 1966. He was backup pilot for Skylab 2 and a mission specialist on STS 41-B during which McCandless and Stewart performed the first untethered EVAs.

Michael J. McCulley; Commander, USN; born August 4, 1943, San Diego, California; married, two children.

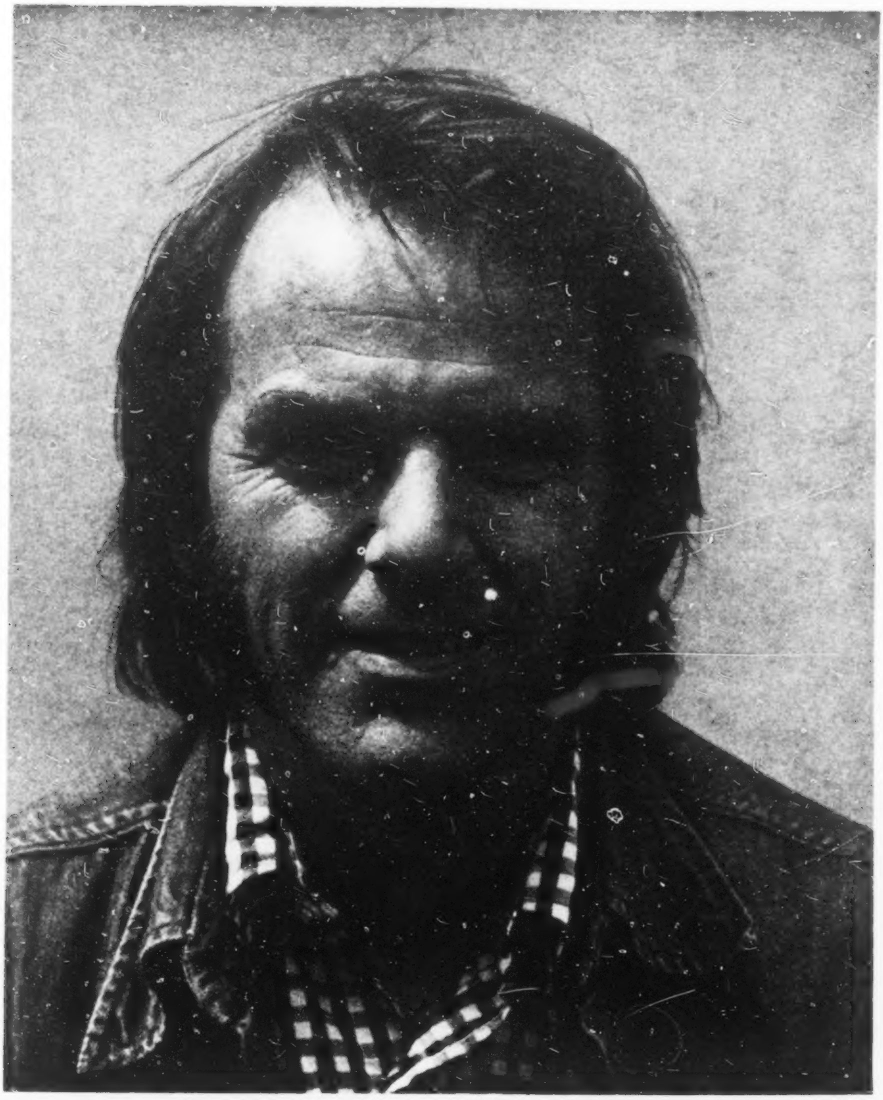
Received bachelor and master of science in metallurgical engineering from Purdue University (1970). He then served as test pilot at the Naval Air Test Center, Patuxent River, Maryland. McCulley was selected as an astronaut candidate in May 1984 and, in May 1985, qualified for assignment as pilot to future shuttle missions.

James Alton McDivitt; Brigadier General, USAF (Retired); born June 10, 1929, Chicago, Illinois; married, four children.

Recevied bachelor of science in aeronautical engineering from the University of Michigan (1959) and was chosen in the second group of astronauts in 1962. He was command pilot of Gemini 4 and commander of Apollo 9. General McDivitt managed the Apollo Spacecraft Program at Johnson Space Center from Septermber 1969 to August 1972. He then resigned from NASA and the Air Force. In April 1975 he joined Pullman Inc. of Chicago, Illinois where he served as Vice President; President, Pullman Standard; and Executive Vice President in that order. He resigned from Pullman on January 31, 1981 to become Vice President, Strategic Management, Rockwell International, Pittsburgh, Pennsylvania. He is now a Executive Vice President of Rockwell's Defense Electronics Operations.

Ronald Erwin McNair; civilian; born October 21, 1950, Lake City, South Carolina; married, two children.

Received bachelor of science in physics from North Carolina A&T University (1971), doctorate in physics from Massachusetts Institute of Technology (1977), presented an honorary doctorate of Laws from North Carolina A&T State University (1978), and an honorary doctorate of science from Morris College (1980). He was chosen with the eighth group of astronauts in 1978. He was a mission specialist on the STS 41-B flight.



Frank Curtis Michel; civilian; born June 5, 1934, La Crosse, Wisconsin; married, two children.

Received bachelor of science degree in physics from the California Institute of Technology (1955), doctorate in physics from CalTech (1962), served as an aviator in the U.S. Air Force Reserve, and was chosen with the fourth group of astronauts in 1965. Dr. Michel resigned from the astronaut corps in August 1969 to become a professor of physics at Rice University. He served for five years as chairman of the Space Physics and Astronomy Program and is currently the Andrew Hays Buchanan professor of astrophysics there.

Edgar Dean Mitchell; Captain, USN (Retired); born September 17, 1930, Hereford, Texas; married, two children (by a previous marriage).

Received bachelor of science in industrial management from Carnegie Institute of Technology (1952), bachelor of science in aeronautical engineering from the U.S. Naval Postgraduate School (1961), doctorate in aeronautics and astronautics from the Massachusetts Institute of Technology (1964), and was chosen with the fifth group of astronauts in 1966. He was backup lunar module pilot for Apollo 10, lunar module pilot for Apollo 14 (sixth man to walk on the Moon), and backup lunar module pilot for Apollo 16. Captain Mitchell retired from the Navy and NASA in October 1972 and founded the Institute of Noetic Sciences in Palo Alto, California, of which he is chairman. He was President, Edgar Mitchell Corporation (EMCO), Palm Beach, Florida from 1974 until 1978. He is currently Chairman, Mitchell Communications Company in Florida. He has written a book entitled *Psychic Exploration: A Challenge for Science.*

Richard Michael Mullane; Colonel, USAF; born September 10, 1945, Witchita Falls; Texas; married, three children.

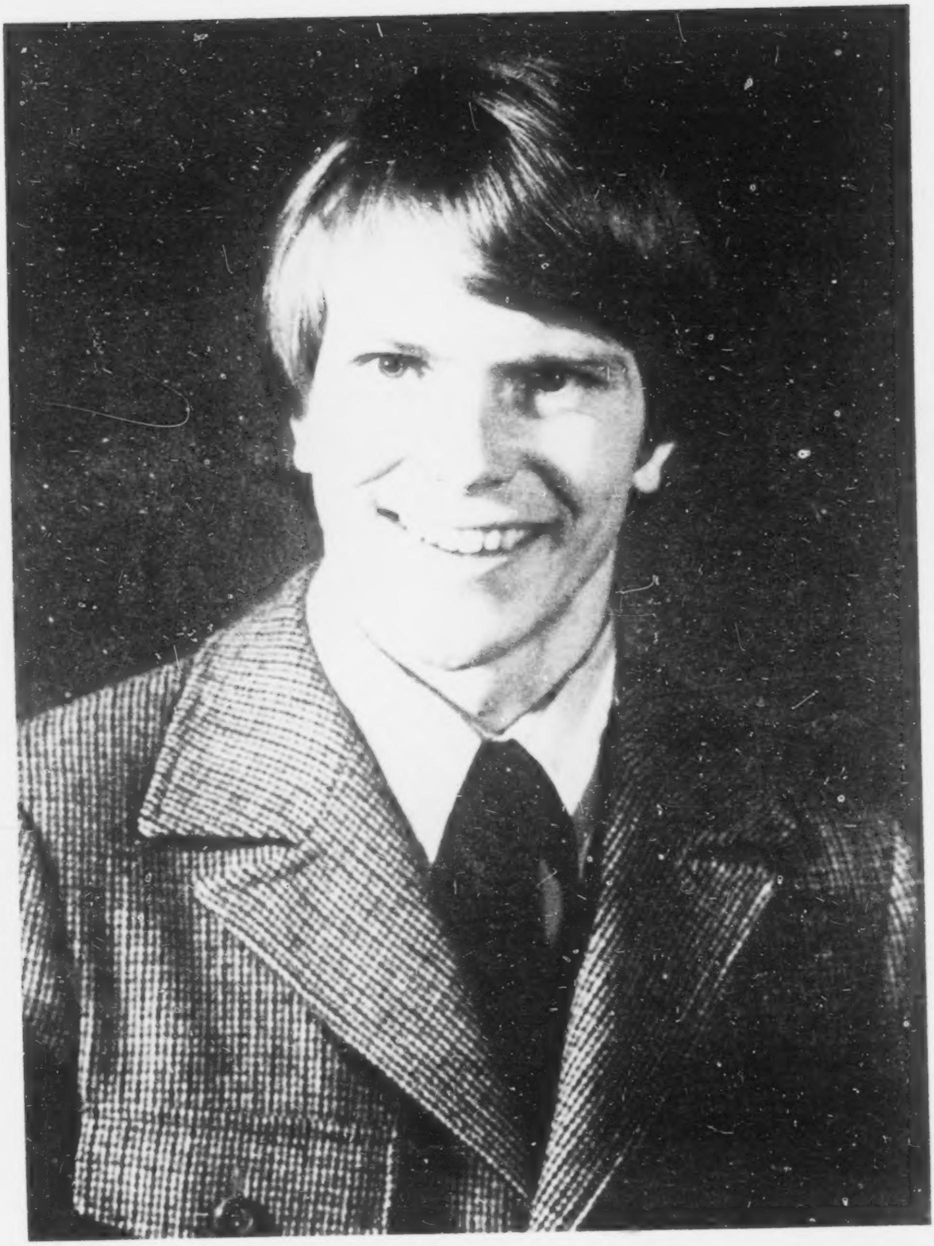
Received bachelor of science from U.S. Military Academy (1967); master of science in aeronautical engineering from the Air Force Institute of Technology (1975); and was chosen with the eighth group of astronauts in 1978. He was a mission specialist on the STS 41-D flight and has been designated to serve as a mission specialist on a future Defense Department mission.

Franklin Story Musgrave; civilian; born August 19, 1935, Boston, Massachusetts; married, five children.

Received bachelor of science degree in math and statistics from Syracuse University (1958), master of business administration in operations analysis and computer programming from the University of California at Los Angeles (1959), bachelor of arts in chemistry from Marietta College (1960), doctor of medicine from Columbia University (1964), master of biophysics from the University of Kentucky (1966), doctorate in physiology from the University of Kentucky (1979), has served in both the U.S. Marine Corps and the U.S. Navy, and was chosen with sixth group of astronauts, in 1967. He was the backup science pilot for Skylab 2 and was a capsule communicator for Skylab 2 and 3. Dr. Musgrave served as a mission specialist on the STS-6 flight, and is scheduled for STS 51-F.

Steven Ray Nagel; Lieutenant Colonel, USAF; born October 27, 1946, Canton, Illinois; married, no children.

Received bachelor of science in aeronautical/astronautical engineering from the University of Illinois (1969), and was chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 51-G and is assigned to be pilot on STS 61-A.

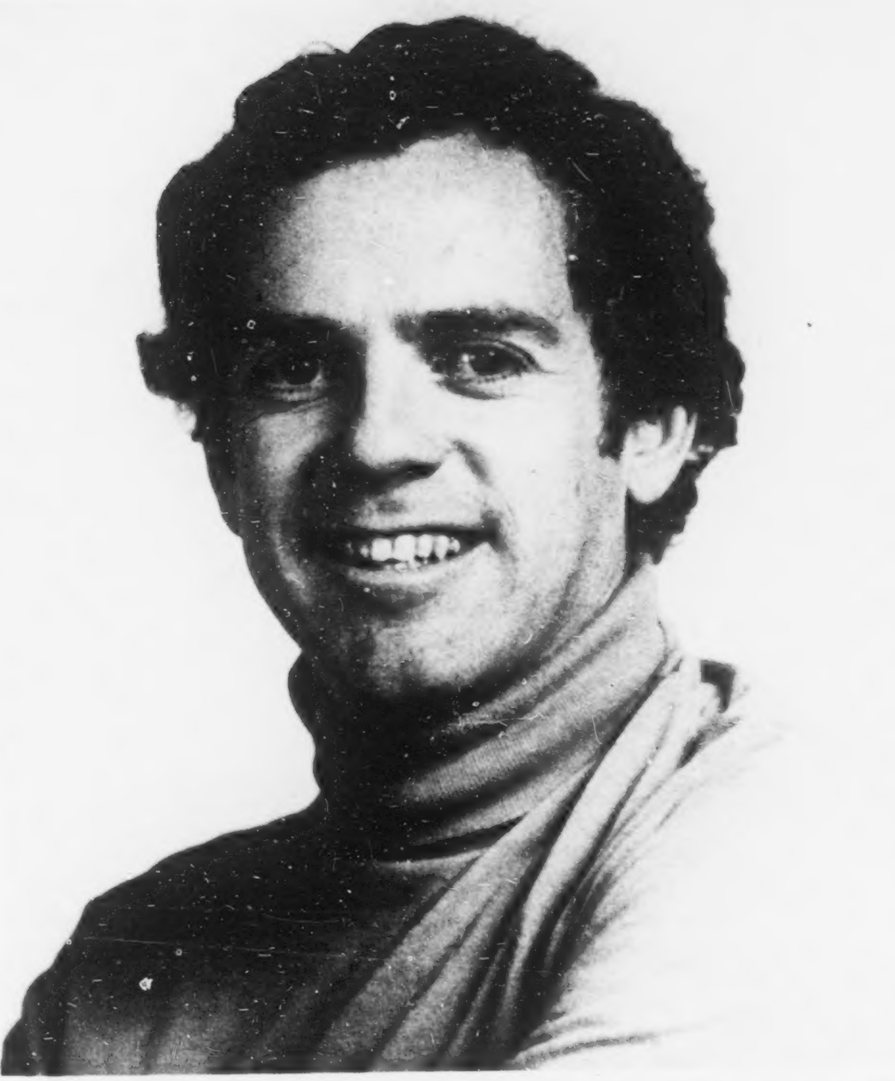


George Driver Nelson; civilian; born July 13, 1950, Charles City, Iowa; married, two children.

Received bachelor of science in physics from Harvey Mudd University (1972); master of science (1974) and doctorate (1977) in astronomy from the University of Washington; and was chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 41-C flight, and is assigned to STS 61-C.

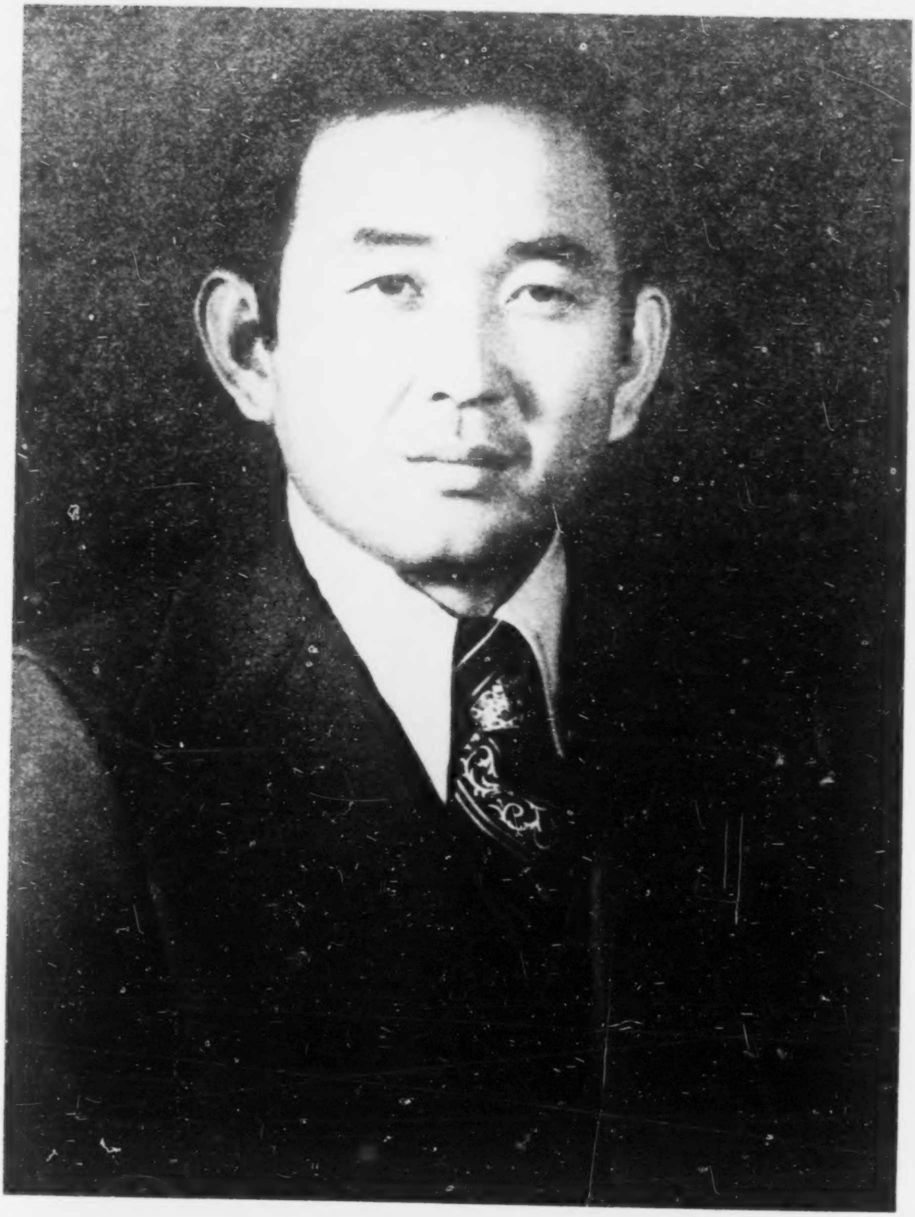
Bryan Daniel O'Connor; Lieutenant Colonel, USMC; born September 6, 1946, Orange County, California; married, two children.

Received bachelor of science in engineering from U.S. Naval Academy (1968); and a master of science in aeronautical systems from the University of West Florida (1970). He has served in Korea and Japan and aboard the U.S.S. *Guam* in the Mediterranean. He graduated from the U.S. Navy Test Pilot School and served as a test pilot at the Navy Air Test Center at Patuxtent River, Maryland. From June 1977 to June 1979, he was the Naval Air Test Center Program Manager for all AV-8 Harrier projects. He is currently assigned as pilot for STS 61-B.



Brian Todd O'Leary; civilian, born January 27, 1940, Boston, Massachusetts; divorced, two children.

Received bachelor of arts degree in physics from Williams College (1961), master of arts in astronomy from Georgetown University (1964), doctorate in astronomy from the University of California at Berkeley (1967), and was chosen with the sixth group of astronauts in 1967. He resigned from NASA in 1968 for personal reasons and took a position on the Cornell University staff. He was an assistant professor at Hampshire College, and later became a special consultant on nuclear energy matters for the Committee on the Interior, U.S. House of Representatives. He was on the research faculty in the Department of Physics at Princeton University. He is currently a senior scientist at Science Applications International Corp., and Chairman of the National Space Council under the Aerospace Education Association. He has written *The Making of an Ex-Astronaut, The Fertile Stars,* and *Project Space Station.*



Ellison Shoji Onizuka; Lieutenant Colonel, USAF; born June 24, 1946, Kealakekua, Hawaii; married, two children.

Received bachelor of science (June 1969) and master of science (December 1969) in aerospace engineering from the University of Colorado, and was Chief of the Engineering Support Section, Training Resources Branch, USAF Test Pilot School, Edwards AFB, California with the eighth group of astronauts in 1978. He was a mission specialist on STS 51-C, the first Department of Defense mission.

Robert Franklyn Overmyer; Colonel, USMC; born July 14, 1936, Lorain, Ohio; married, three children.

Received bachelor of science degree in physics from Baldwin-Wallace College (1958), master of science in aeronautics at the U.S. Naval Postgraduate School (1964), was selected for the MOL program (see Chapter 3) in 1966, and transferred to the NASA astronaut group in 1969. He was part of the support crew for the Apollo-Soyuz Test Project, and was the pilot on the STS-5 flight. He commanded the Spacelab 3 mission, STS 51-B.

Robert Allan Ridley Parker; civilian; born December 14, 1936, New York, New York; married, two children.

Received bachelor of arts degree in astronomy and physics from Amherst College (1958), doctorate in astronomy from the California Institute of Technology (1962), and was chosen with the sixth group of astronauts in 1967. He was mission scientist for Apollo 17 and chief scientist for the Skylab missions. Dr. Parker was a mission specialist for Spacelab 1 (STS-9) in 1983.

Donald Herod Peterson; Colonel, USAF (Retired); born October 22, 1933, Winona, Mississippi; married, three children.

Received bachelor of science from the U.S. Military Academy (1955), master of science in nuclear engineering from the Air Force Institute of Technology (1962), was selected for the MOL program (see chapter 3) in 1967, and transferred to the NASA astronaut group in 1969. He retired from the Air Force in January 1980. He was a mission specialist on the STS-6 flight, during which he and Musgrave performed the first shuttle EVA. He resigned from NASA in December 1984, and is currently President of Aerospace Operation Consultants, Inc.

William Reid Pogue; Colonel, USAF (Retired); born January 23, 1930, Okemah, Oklahoma; married, three children.

Received bachelor of science degree in education from Oklahoma Baptist University (1951), master of science in math from Oklahoma State University (1960), and was chosen with the fifth group of astronauts in 1966. He was pilot of Skylab 4. Colonel Pogue resigned from NASA September 1, 1975, to become a Vice-President of the High Flight Foundation in Colorado Springs, Colorado. He is currently in private business, William R. Pogue Associates, Inc., based in Arkansas.

Judith Arlene Resnik; civilian; born April 5, 1949, Akron, Ohio; single.

Received bachelor of science in electrical engineering from Carnegie Mellon University (1970); doctorate in electrical engineering from the University of Maryland (1977); and was chosen with the eighth group of astronauts in 1978. She was mission specialist on STS 41-D.

Richard Noel Richards; Commander, USN; born August 24, 1946, Key West, Florida; married, no children.

Received bachelor of science in chemical engineering from the University of Missouri (1969); and a master of science in aeronautical systems from the University of West Florida (1970). He graduated from the U.S. Naval Test Pilot School at Patuxent River, Maryland, in 1976, and served as a test pilot. He is currently assigned to be pilot on STS 61-E.

Sally Kristen Ride; civilian; born May 26, 1951, Los Angeles, California; married (to astronaut Steven Hawley), no children.

Received bachelor of science in physics (1973), bachelor of arts in English (1973), and master of science in physics (1975), doctorate in physics (1978) from Stanford University; and was chosen with the eighth group of astronauts in 1978. She subsequently performed as an on-orbit capsule communicator for the STS-2 and STS-3 missions. Dr. Ride served as a mission specialist for STS-7, and thus became the first American woman in space. She was also a mission specialist on STS 41-G.

Stuart Allen Roosa; Colonel, USAF (Retired); born August 15, 1933, Durango, Colorado; married, four children.

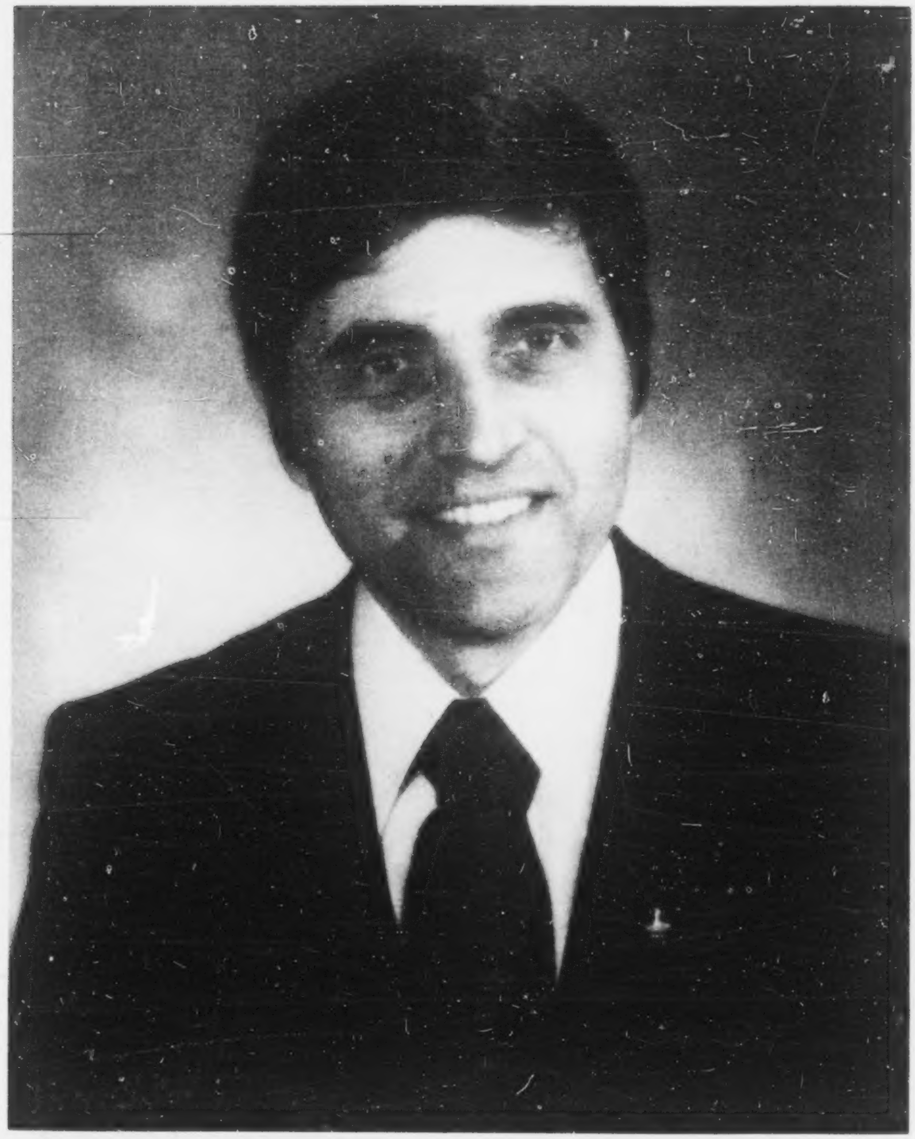
Received bachelor of science in aeronautical engineering from the University of Colorado (1960) and was chosen with the fifth group of astronauts in 1966. He was the command module pilot of Apollo 14, and backup command module pilot for Apollo 16 and Apollo 17. Colonel Roosa resigned from NASA on February 1, 1976 to become Vice-President for International Affairs, U.S. Industries Middle East Development Company, based in Athens, Greece. In 1977 he returned to the United States to become President of Jet Industries in Austin, Texas. He was later in private business in Austin and is currently President, Gulf Coast Coors, Inc.

Jerry Lynn Ross; Major, USAF; born January 20, 1948, Crown Point, Indiana; married, two children.

Received bachelor of science (1970) and master of science (1972) in mechanical engineering from Purdue University. He was chief B-1 flight test engineer at Edwards Air Force Base, California, and was chosen as a mission specialist astronaut candidate in 1980. He is currently assigned as a mission specialist on the STS 61-B flight.

Walter Marty Schirra, Jr.; Captain, USN (Retired); born March 12, 1923, Hackensack, New Jersey; married, two children.

Received bachelor of science from the U.S. Naval Academy (1945) and was chosen in the first group of astronauts in 1959. He was backup pilot for Mercury-Atlas 7 (Aurora 7), pilot of Mercury-Atlas 8 (Sigma 7), backup command pilot of Gemini 3, command pilot of Gemini 6, and commander of Apollo 7. Captain Schirra retired from NASA and the Navy in July 1969 to become Chairman and Chief Executive Officer of the Environmental Control Company, Englewood, Colorado, and Chairman, Sernco, Inc. In 1976 he became Director of Marketing-Powerplant and Aerospace Systems, Johns Manville Company, and Vice-President, Johns Manville Corporation, in Denver, Colorado. In December 1977 he resigned those positions to become Vice-President for Development for Goodwin Companies in Middleton, Colorado. In 1980 he was elected to the Board of Directors of Electromedics Inc. He is currently a consultant in Sante Fe, California and a public speaker.



Harrison "Jack" Hagan Schmitt; civilian; born July 3, 1935, Santa Rita, New Mexico; single.

Received bachelor of science degree in science from the California Institute of Technology (1957), doctorate in geology at Harvard University (1964), and was chosen with the fourth group of astronauts in 1965. He was backup lunar module pilot for Apollo 15, and lunar module pilot for Apollo 17 (twelfth man to walk on the Moon). In May 1974 he was named NASA's Assistant Administrator for Energy Programs, a position he resigned on August 30, 1975, to enter politics. He was U.S. Senator from the State of New Mexico from 1976–1982. He is currently a member of the President's Foreign Intelligence Advisory Board and the National Strategic Materials and Minerals Program Advisory Committee, and has served as an advisor to the Department of Defense.

Russell Louis Schweickart; civilian; born October 25, 1935, Neptune, New Jersey; married, five children.

Received bachelor of science in aeronautical engineering from Massachusetts Institute of Technology (1956), master of science in aeronautics and astronautics from MIT (1963), served in the U.S. Air Force as an aviator, and was chosen with the third group of astronauts in 1963. He was lunar module pilot on Apollo 9 and backup commander for Skylab 2. Mr. Schweickart was NASA's Director of User Affairs in the Office of Applications before becoming Assistant for Payload Operations in the Office of Planning and Program Integration at NASA Headquarters in November 1976. He went on a leave of absence from NASA to act as science adviser to Governor Brown of California, then resigned from NASA in 1979. In August 1980, he became Chairman of the California State Energy Commission. Currently, he is a visiting scientist at the Massachusetts Institute of Technology.

Francis Richard Scobee; Major, USAF (Retired); born May 19, 1939, Cle Elum, Washington; married, two children.

Received bachelor of science in aerospace engineering from the University of Arizona (1965), and was a test pilot, Air Force Flight Test Center, Edwards AFB, California when he was choosen with the eighth group of astronauts in 1978. He retired from the Air Force in January 1980. He was pilot for the STS 41-C mission and is assigned to be commander on STS 51-L.

David Randolph Scott; Colonel, USAF (Retired); born June 6, 1932, San Antonio, Texas; married, two children.

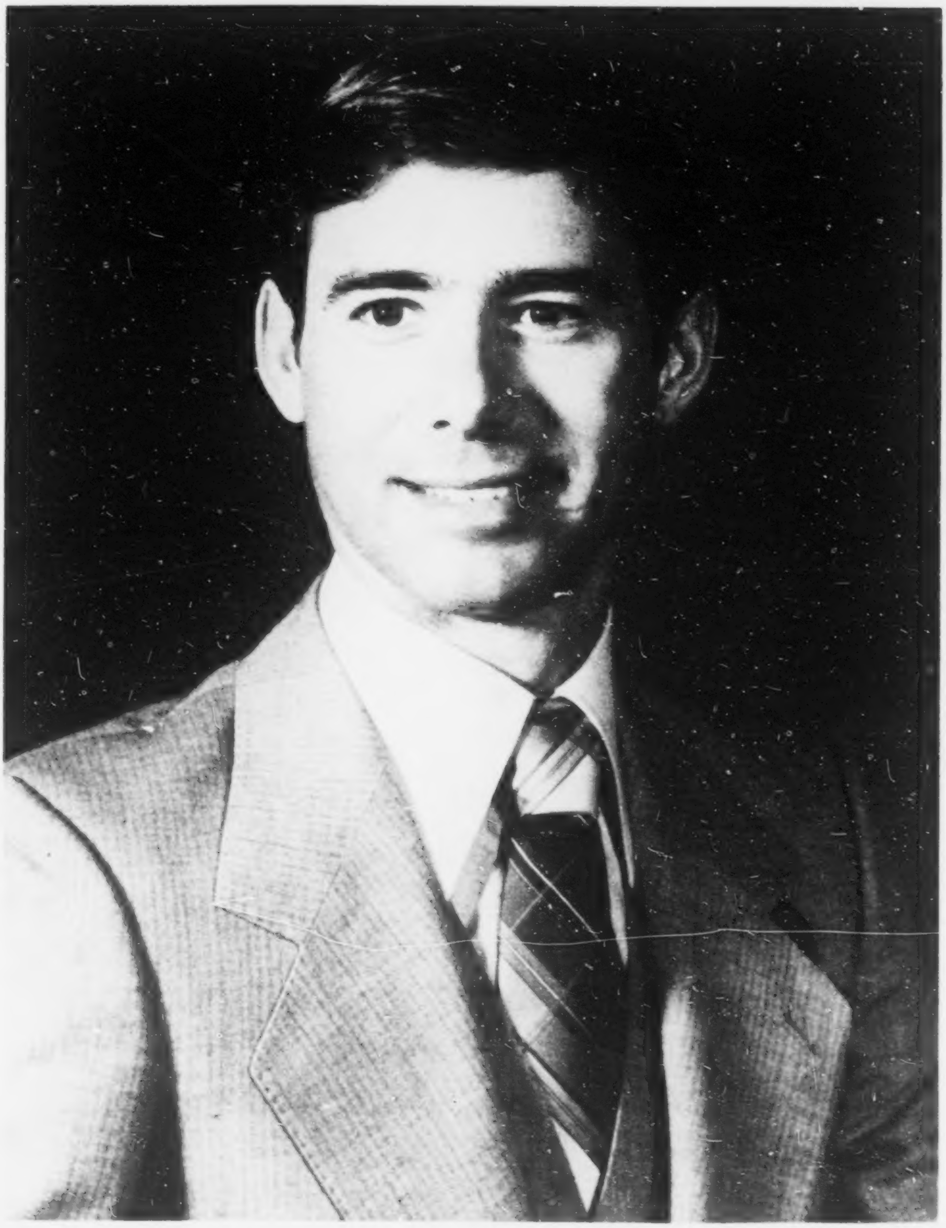
Received bachelor of science degree from the U.S. Military Academy (1954), master of science in aeronautics and astronautics and an engineer of aeronautics and astronautics degree from the Massachusetts Institute of Technology (1962), and was chosen with the third group of astronauts in 1963. He was pilot of Gemini 8, command module pilot of Apollo 9, backup commander of Apollo 12, and commander of Apollo 15 (seventh man to walk on the Moon). In July 1972, Colonel Scott became Special Assistant for Mission Operations for the Apollo-Soyuz Test Project, and in April 1975 was appointed Director, NASA Dryden Flight Research Center, Edwards, California. He resigned that position on October 30, 1977, to found his own company, Scott-Preyss Associates which is now Scott Science and Technology, Inc. in Los Angeles.

Margaret Rhea Seddon; civilian; born November 8, 1947, Murfreesboro, Tennessee; married (to astronaut Robert L. Gibson), one child.

Received bachelor of arts in physiology from the University of California, Berkeley (1970); doctor of medicine from the University of Tennessee College of Medicine (1973); and was a resident physician in the Department of Surgery, City of Memphis Hospital, Memphis, Tennessee when she was chosen with the eighth group of astronauts in 1978. She served as a mission specialist on STS 51-D.

Elliot McKay See, Jr.; civilian; born July 23, 1927, Dallas, Texas; died February 28, 1966, in the crash of a T–38 jet near St. Louis, Missouri; was married, three children.

Received bachelor of science degree from the U.S. Merchant Marine Academy (1949), served as an aviator in the U.S. Navy, received master of science in engineering from the University of California at Los Angeles (1962), and was chosen in the second group of astronauts in 1962. He was backup pilot for Gemini 5 and was slated to be command pilot for Gemini 9 at the time of his death.



Brewster Hopkinson Shaw, Jr.; Lieutenant Colonel, USAF; born May 16, 1945, Cass City, Michigan; married, three children.

Received bachelor of science (1968) and master of science (1969) in engineering mechanics from the University of Wisconsin, and was an instructor with the U.S. Air Force Test Pilot School, Edwards AFB, California when he was chosen with the eighth group of astronauts in 1978. He served as a pilot on the Spacelab 1 mission (STS-9) in 1983, and will be commander of STS 61-B.

Alan Bartlett Shepard, Jr.; Rear Admiral, USN (Retired); born November 18, 1923, East Derry, New Hampshire; married, two children.

Received bachelor of science degree from the U.S Naval Academy (1944) and was chosen with the first group of astronauts in 1959. He was pilot of Mercury-Redstone 3 (Freedom 7) becoming America's first man in space, backup pilot for Mercury-Atlas 9, was subsequently grounded due to an inner ear ailment until May 7, 1969 (during which time he served as chief of the (Astronaut Office), commander of Apollo 14 (fifth man to walk on the Moon), and in June 1971 resumed duties as chief of the Astronaut Office. He retired from NASA and the Navy Aug. 1, 1974, to join the Marathon Construction Company of Houston, Texas, as partner and chairman. He is currently President of the Windward Coors Company, Deer Park, Texas.

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WILLIAM SHEPHERD
JSC HOUSTON
NASA

William. M. Shepherd; Lieutenant Commander, USN; born July 29, 1949, Oak Ridge, Tennessee; single.

Received bachelor of science in aerospace engineering, U.S. Naval Academy (1971), master of science and the degree of ocean engineer from Massachusetts Institute of Technology (1978). He was serving as Commander, Special Boat Unit TWENTY, Little Creek, Virginia when selected in the May 1984 astronaut class. Shepherd is now eligible for future assignment as mission specialist for future shuttle flights.

Loren James Shriver; Colonel, USAF; born September 23, 1944, Jefferson, Iowa; married, four children.

Received bachelor of science from U.S. Air Force Academy (1967); master of science in astronauts from Purdue University (1968); and was a test pilot, Air Force Flight Test Center, Edwards AFB, California when he was chosen with the eighth group of astronauts in 1978. He was pilot of STS 51-C.

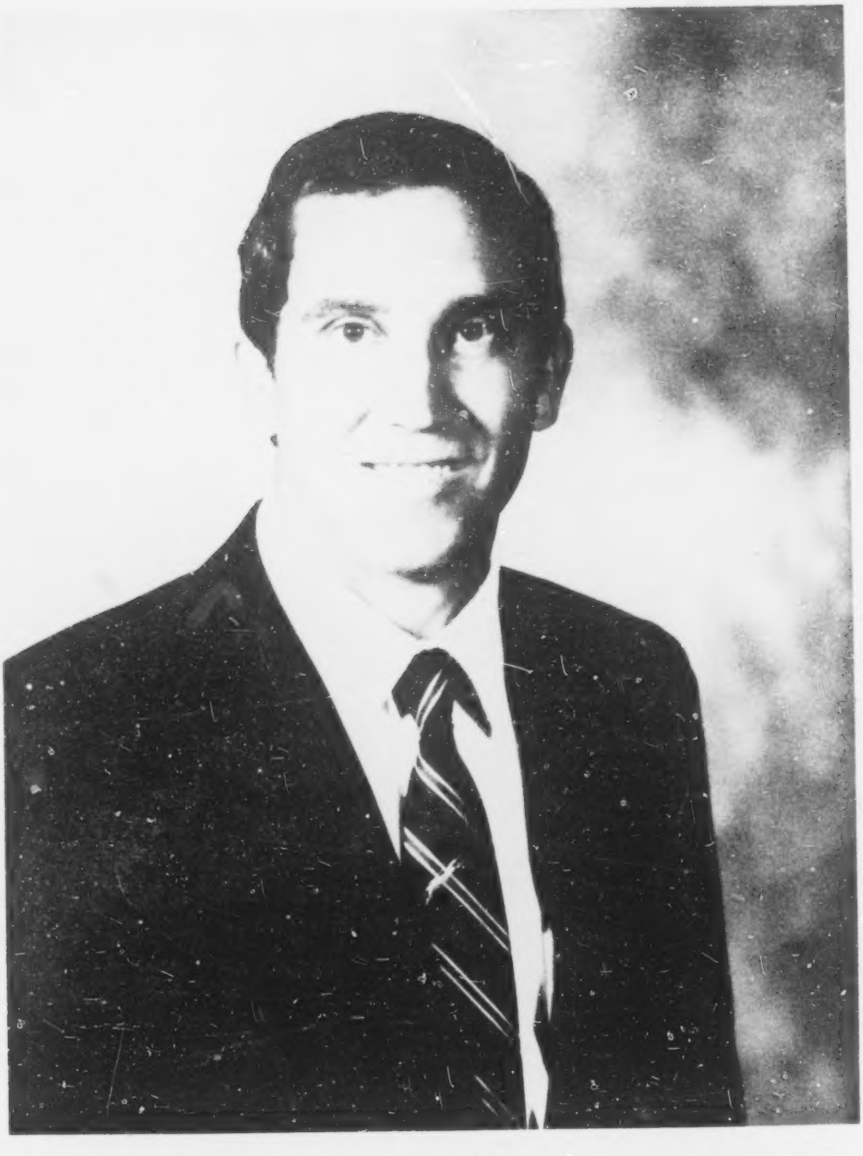
NASA
NASA
ELLEN SHULMAN
JSC HOUSTON
NASA
USA

Ellen L. Shulman; civilian; born April 27, 1953, Fayetteville, North Carolina; single.

Received bachelor of arts in geology, State University at Buffalo (1974) and doctorate in medicine, Cornell (1978). She joined NASA as a medical officer at Johnson Space Center, working at the Flight Medicine Clinic. She was selected as an astronaut in May 1984, and, following training, is now eligible for assignment to future shuttle flights.

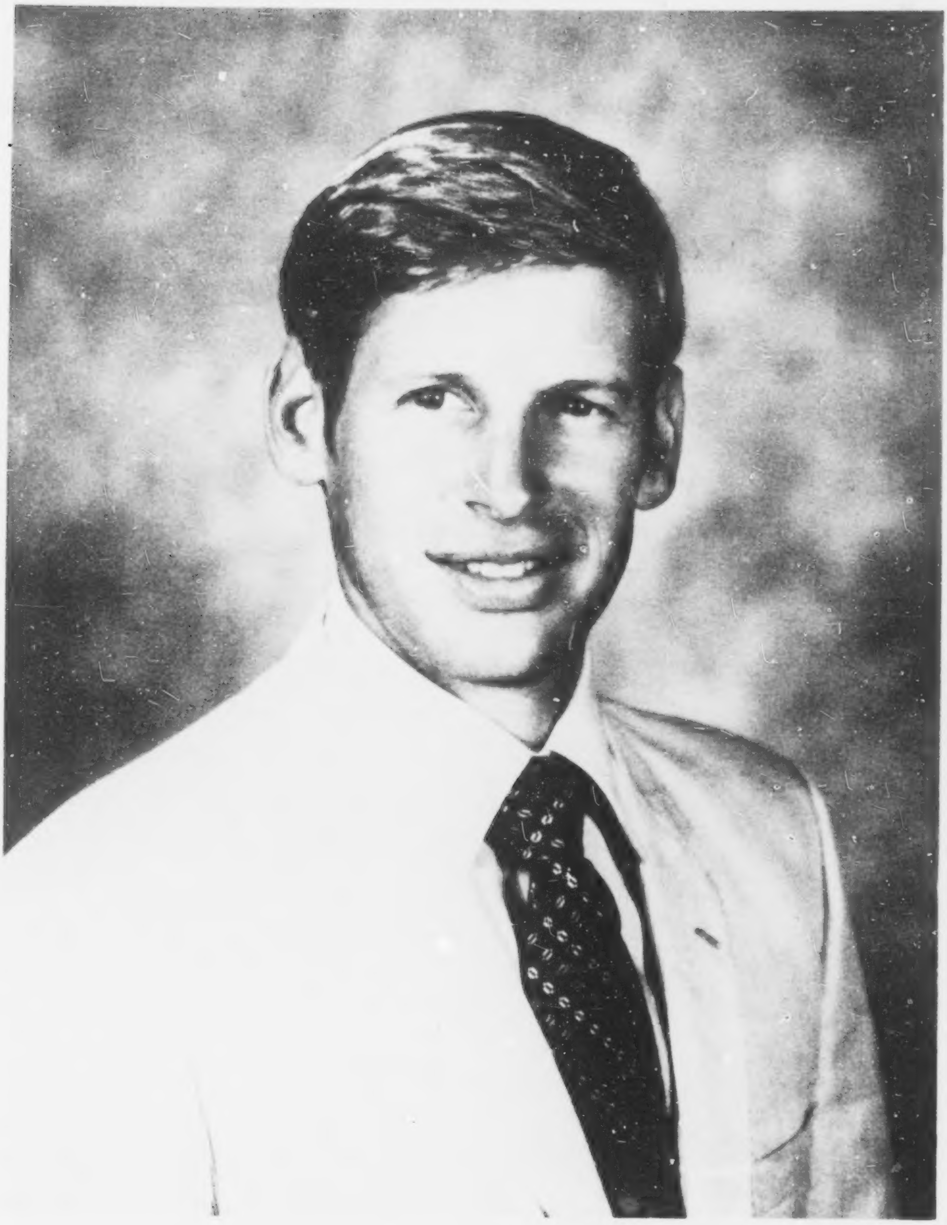
Donald "Deke" Kent Slayton; Major, USAF (Retired); born March 1, 1924, Sparta, Wisconsin; married, one child.

Received bachelor of science in aeronautical engineering from the University of Minnesota (1949) and was chosen with the first group of astronauts in 1959. He was chosen as command pilot for Mercury-Atlas 7 (Aurora 7), but was removed due to detection of a heart murmur. He resigned his commission as an Air Force Major in November 1963, but continued as an active member of the astronaut team, becoming Director of Flight Crew Operations, a position he held until February 1974. Mr. Slayton returned to flight status in March 1972 and was docking module pilot for the Apollo-Soyuz Test Project. He was a manager for the shuttle orbital flight tests. He left NASA in February 1982 and currently serves as a consultant for Aerospace Corp. and Space Services, Inc., Houston, Texas.



Michael John Smith; Commander, USN; born April 30, 1945, Morehead City, North Carolina; married, three children.

Received bachelor of science in naval science from the U.S. Naval Academy (1967); and a master of science in aeronautical engineering from the U.S. Naval Postgraduate School (1968). He completed a Vietnam tour of duty aboard the U.S.S. *Kitty Hawk,* graduated from the U.S. Navy Test Pilot School in 1974, and served for 18 months as an instructor at the U.S. Navy Test Pilot School. He was chosen as a pilot astronaut candidate in 1980, and is currently assigned to STS 51-L.



Sherwood Clark Spring; Lieutenant Colonel, USA; born September 3, 1944, Hartford, Connecticut; married, one child.

Received bachelor of science in general engineering from the U.S. Military Academy (1967); and a master of science in aerospace engineering from the University of Arizona (1974). He was a combat pilot in Vietnam; and a test pilot at Edwards Air Force Base, California. He was serving as an operations officer for the 19th Aviation Battalion in Pyontaek, Korea, when he was chosen as a mission specialist astronaut candidate in 1980. He is currently assigned as a mission specialist for STS 61-B.

Robert Clyde Springer; Colonel, USMC; born May 21, 1942, St. Louis, Missouri; married, three children.

Received bachelor of science in naval science from the U.S. Naval Academy (1964); and a master of science in operations research and systems analysis from the U.S. Naval Postgraduate School (1971). Served as a combat pilot in Vietnam; graduated from the U.S. Navy Test Pilot School at Patuxent River, Maryland, in 1975; and served as a test pilot. He was an aide-de-camp for the Commanding General, Fleet Marine Force, Atlantic, when he was chosen as a mission specialist astronaut candidate in 1980. He is currently eligible for assignment on future shuttle flights.

Thomas Patten Stafford; Lieutenant General, USAF (Retired); born September 17, 1930, Weatherford, Oklahoma; married, two children.

Received bachelor of science degree from the U.S. Naval Academy (1952) and was chosen with the second group of astronauts in 1962. He was backup pilot for Gemini 3, pilot for Gemini 6, became command pilot for Gemini 9 upon the death of a prime crew member, backup commander for Apollo 7, commander of Apollo 10, and commander of the Apollo-Soyuz Test Project. He resigned from NASA on November 1, 1975, to become commander of the Air Force Flight Test Center, Edwards Air Force Base, California. In March 1978 he was promoted to Air Force Deputy Chief of Staff for Research and Development in Washington, D.C. In November 1979 he retired from the Air Force and became Executive Vice President of Commercial Sales and Finance for American Farm Line in Oklahoma City, Oklahoma. He is currently a consultant with Defense Technology, Oklahoma City.

Robert Lee Stewart: Colonel, USA; born August 13, 1942, Washington, D.C.; married, two children.

Received bachelor of science in mathematics from the University of Southern Mississippi (1964); master of science in aerospace engineering from the University of Texas, Arlington (1971); and was a test pilot, U.S. Army Aviation Engineering Flight Activity, Edwards AFB, California when he was chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 41-B, during which Stewart and McCandless conducted the first untethered spacewalks. He has been assigned to STS 51-J.

Kathryn Dwyer Sullivan; civilian; born October 3, 1951, Paterson, New Jersey; single.

Received bachelor of science in earth sciences from the University of California, Santa Cruz (1973), doctorate in geology from Dalhousie University, Halifax, Nova Scotia (1978), and was chosen with the eighth group of astronauts in 1978. She served as a mission specialist on STS 41-G, during which she became the first American woman to perform an EVA (spacewalk). Dr. Sullivan was also appointed to the National Commission on Space.

John Leonard Swigert, Jr.; civilian; born August 30, 1931, Denver, Colorado, died December 28, 1982 of bone cancer; was single.

Received bachelor of science degree in mechanical engineering from the University of Colorado (1953), served as an aviator in the U.S. Air Force, received master of science in aerospace science from Rensselaer Polytechnic Institute (1965), master of science in business administration from the University of Hartford (1967), and was chosen with the fifth group of astronauts in 1966. He was scheduled to be backup command module pilot for Apollo 13 but became command module pilot 72 hours prior to launch when a prime crew member was exposed to measles. Mr. Swigert took a leave of absence from NASA in April 1973 to become Executive Director of the Committee on Science and Technology, U.S. House of Representatives. He resigned from NASA and the committee on August 31, 1977, to enter politics. In 1979 he became Vice President of B.D.M. Corporation, Golden, Colorado, and on November 11, 1982 he was elected to the U.S. House of Representatives. He died on December 28, 1982 of bone cancer, before he could be sworn in.

Norman Earl Thagard; civilian; born July 3, 1943, Marianna, Florida; married, three children.

Received bachelor of science (1965) and master of science (1966) in engineering science from Florida State University; served in the U.S. Marine Corps as an aviator; received doctor of medicine from the University of Texas Southwestern Medical School (1977); and was chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS-7 and Spacelab 3/STS 51-B.

Kathryn C. Thornton; civilian; born August 17, 1952, Montgomery, Alabama; married, three children.

Received bachelor of science in physics, Auburn University (1974), master of science (1977) and doctorate (1979) in physics, University of Virginia. She was awarded a NATO Postdoctoral Fellowship for research at the Max Planck Institute for Nuclear Physics in West Germany. Thornton was a physicist at the U.S. Army Foreign Science and Technology Center when selected as an astronaut candidate in May 1984.

William Edgar Thornton; civilian; born April 14, 1929, Faison, North Carolina; married, two children.

Received bachelor of science degree in physics from the University of North Carolina (1952), doctor of medicine from the University of North Carolina (1963), served in the U.S. Air Force, and was chosen with the sixth group of astronauts in 1967. He is a clinical instructor in the Department of Medicine at the University of Texas. He was a crew member of the Skylab Medical Experiments Altitude Test, a member of the support crew for Skylab 2, 3, and 4, and served as mission specialist on STS-8 in 1983 and on Spacelab 3 (STS 51-B) in 1985.

Richard Harrison Truly; Commodore, USN; born November 12, 1937, Fayette, Mississippi; married, three children.

Received bachelor of aeronautical engineering degree from the Georgia Institute of Technology (1959), was selected for the MOL program (see chapter 3) in 1965, and transferred to the NASA astronaut group in 1969. He was a member of the astronaut support crew for Skylab 2, 3, and 4 and the Apollo-Soyuz Test Project, and is currently assigned to space shuttle development. He was a member of one of the two shuttle approach and landing test crews and was the pilot on the STS-2 flight, and commander for STS-8. Truly is currently commander of Naval Space Command.

James Dougal Adrianus van Hoften; civilian; born June 11, 1944, Fresno, California; married, three children.

Received bachelor of science in civil engineering from the University of California, Berkeley (1966); master of science in hydraulic engineering from Colorado State University (1968); served in the U.S. Navy as an aviator; doctorate in fluid mechanics from Colorado State University (1976); and was Assistant Professor of Civil Engineering, University of Houston, Houston, Texas when he was chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 41-C and is assigned to STS 51-I.

Charles Lacy Veach; civilian; born September 18, 1944, Chicago, Illinois; married, two children.

Received bachelor of science in engineering management, Air Force Academy (1966). In 1982, began working at Johnson Space Center as an engineer and research pilot. In May 1984, Veach was selected as an astronaut candidate and is now eligible for assignment as a mission specialist on future shuttle crews.

David Mathieson Walker; Captain, USN; born May 20, 1944, Columbus, Georgia; unmarried, two children (by a previous marriage).

Received bachelor of science from U.S. Naval Academy (1966), and was a naval aviator, VF-142 (USS *America*), FPO New York when he was chosen with the eighth group of astronauts in 1978. He was pilot on STS 51-A.

Paul Joseph Weitz; Captain, USN (Retired); born July 25, 1932, Erie, Pennsylvania; married, two children.

Received bachelor of science degree in aeronautical engineering from Pennsylvania State University (1954), master of science in aeronautical engineering from the U.S. Naval Postgraduate School (1964), and was chosen with the fifth group of astronauts in 1966. He was pilot for Skylab 2. Captain Weitz retired from the Navy on June 1, 1976. He served as the commander of the STS-6 flight.

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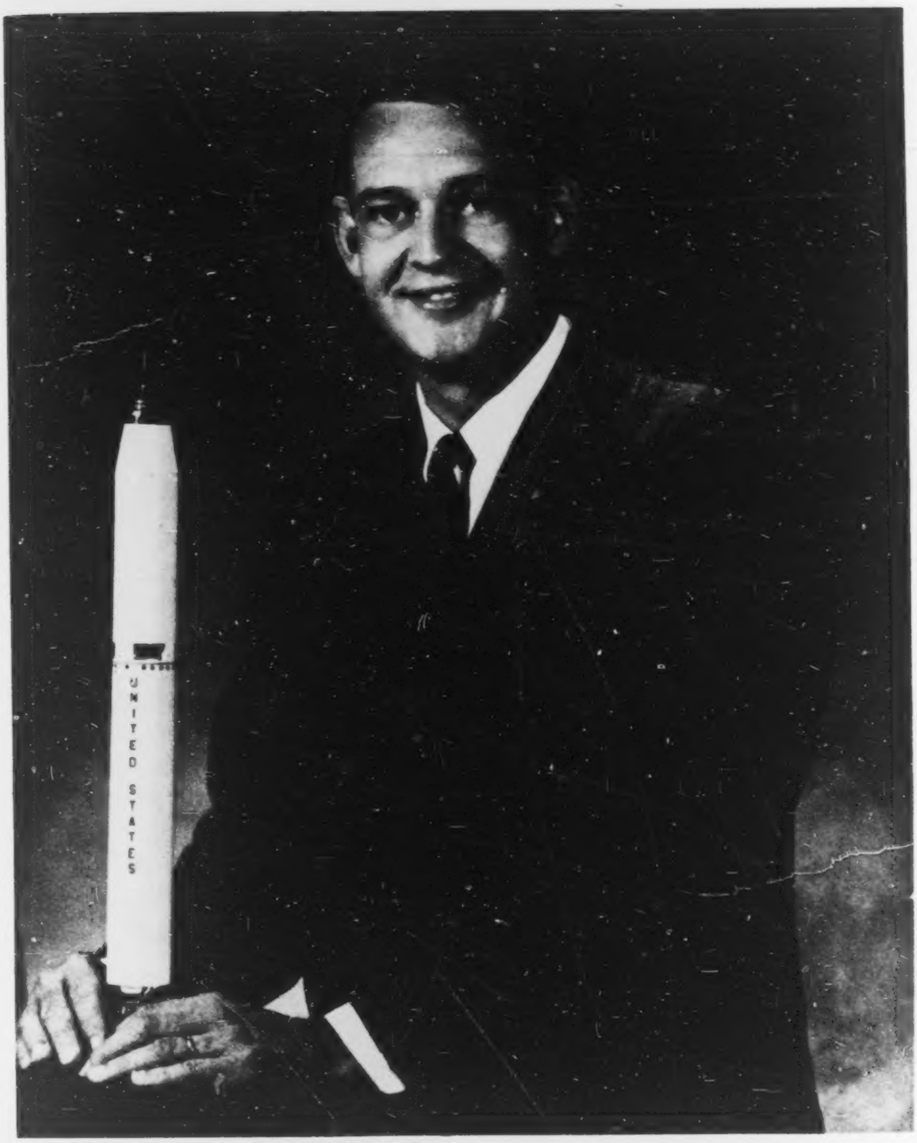
James D. Wetherbee; Lieutenant, USN; born November 27, 1952, Flushing New York; married.

Received bachelor of science in aerospace engineering, University of Notre Dame (1974). He was serving as a test pilot, Naval Air Station Lemoore, California when selected as an astronaut candidate in May 1984. In May 1985, following training, he became eligible for future shuttle crew assignment.

Edward Higgins White II; Lieutenant Colonel, USAF; born November 14, 1930, San Antonio, Texas; died January 27, 1967, in the Apollo 204 fire at Cape Kennedy, Florida; was married, two children.

Received bachelor of science degree from the U.S. Military Academy (1952), master of science in aeronautical engineering from the University of Michigan (1959), and was chosen with the second group of astronauts in 1962. He was pilot of Gemini 4 (first American to perform extravehicular activity), backup command pilot for Gemini 7, and had been selected to be command module pilot for the first manned Apollo flight.



Clifton Curtis Williams, Jr.; Major, USMC; born September 26, 1932, Mobile, Alabama; died October 5, 1967, in the crash of a T-38 jet near Tallahassee, Florida; was married, two children.

Received bachelor of science in mechanical engineering from Auburn University (1954), and was chosen with the third group of astronauts in 1963. He was backup pilot for Gemini 10.

Donald Edward Williams; Commander, USN; born February 13, 1942. Lafayette, Indiana; married, two children.

Received bachelor of science in mechanical engineering from Purdue University (1964), and was a naval aviator, Readiness Training Squadron, NAS Lemoore, California when he was chosen with the eighth group of astronauts in 1978. He was pilot on STS 41-D.

Alfred Merrill Worden: Lieutenant Colonel, USAF (Retired); born February 7, 1932, Jackson, Michigan; married, three children.

Received bachelor of science degree from the U.S. Military Academy (1955), master of science degrees in astronautical/aeronautical engineering and instrumentation engineering from the Univeristy of Michigan (1963), and was chosen with the fifth group of astronauts in 1966. He was backup command module pilot for Apollo 12 and command module pilot for Apollo 15 In September 1972, Colonel Worden was assigned to NASA Ames Research Center, Moffett Field, California, as Director of Advanced Reseach and Technology. He resigned from NASA and the Air Force on September 1, 1975, and was President of the Energy Management Consulting Company. He is currently President of Air-100, a helicopter charter and aircraft management company in Florida. He has written a book of poetry entitled *Hello Earth: Greetings from Endeavour,* and a children's book, *A Flight to the Moon.*

John Watts Young; Captain, USN (Retired); born September 24, 1930, San Francisco, California; married, two children (by a previous marriage).

Received bachelor of science degree in aeronautical engineering from the Georgia Institute of Technology (1952) and was chosen with the second group of astronauts in 1962. He was pilot of Gemini 3, backup pilot of Gemini 6, command pilot for Gemini 10, backup command module pilot for Apollo 7, command module pilot of Apollo 10, backup commander for Apollo 13, commander for Apollo 16 (ninth man to walk on the Moon), and backup commander of Apollo 17. He retired from the Navy on September 30, 1976, and is currently Chief of the Astronaut Office, and was the commander of the first shuttle orbital flight test. He commanded the Spacelab 1 mission, STS-9, in 1983.

TABLE 1-5

SUMMARY OF NASA ASTRONAUTS

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Adamson*	X/1984	USA/Major	New York	pending	Eligible for future shuttle missions.
Aldrin	III/1963	USAF/(Col.)	New Jersey	Gemini 12 Apollo 11	Consultant in Los Angeles and Professor at University of N. Dakota.
Allen*	VI/1967	Civilian	Indiana	STS-5 STS 51-A	Executive Vice President, Space Industries, Inc.
Anders	III/1963	USAFR/Col.	Hong Kong	Apollo 8	Executive Vice President, Aerospace, for Textron, Inc.
Armstrong	II/1962	Civilian	Ohio	Gemini 8 Apollo 11	Chairman of the Board, Computing Technologies for Aviation. Appted. to National Commission on Space.
Bagian*	IX/1980	Civilian	Pennsylvania	pending	Assigned to space shuttle program.
Bassett	III/1963	USAF/Maj.	Ohio	none	Killed in T-38 crash in February 1966.
Bean	III/1963	USN/(Capt.)	Texas	Apollo 12 Skylab 3	Pursuing a career as a painter.
Blaha*	IX/1980	USAF/Col.	Texas	pending	Assigned as pilot to STS 61-H.
Bluford*	VIII/1978	USAF/Col.	Pennsylvania	STS-8	Will be a mission specialist STS 61-A.
Bobko*	VII/1969	USAF/Col.	New York	STS-6 STS 51-D	Will be commander of STS 51-J.
Bolden*	IX/1980	USMC/Lt. Col.	South Carolina	pending	Assigned as pilot on STS 61-C.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Borman	II/1962	USAF/(Col.)	Indiana	Gemini 7 Apollo 8	President, Eastern Airlines.
Brand*	V/1966	Civilian	Colorado	Apollo-Soyuz STS-5 STS 41-B	Assigned to shuttle program.
Brandenstein*	VIII/1978	USN/Capt.	Wisconsin	STS 8 STS 51-G	Assigned to shuttle program.
Bridges*	IX/1980	USAF/Col.	Georgia	pending	Will be pilot on STS 51-F.
Brown*	X/1984	USAF/Capt.	Indiana	pending	Assigned to space shuttle program.
Buchli*	VIII/1978	USMC/Col.	South Dakota	STS 51-C	Will be a mission specialist on Spacelab D-1.
Bull	V/1966	USN/(Lt.Cdr.)	Tennessee	none	Research scientist, NASA Ames Research Center.
Cameron*	X/1984	USMC/Maj.	Ohio	pending	Assigned to shuttle program.
Carpenter	I/1959	USN/(Cdr.)	Colorado	Mercury-Atlas 7	Engineering consultant.
Carr	V/1966	USMC/(Col.)	Colorado	Skylab 4	Senior consultant, Applied Research Inc.
Carter*	X/1984	USN/Cdr.	Georgia	pending	Assigned to shuttle program.
Cernan	III/1963	USN/(Capt.)	Illinois	Gemini 9 Apollo 10 Apollo 17	Cernan Corp., Houston, Texas.
Chaffee	III/1963	USN/Lt.Cdr.	Michigan	none	Died in Apollo 204 fire.
Chang-Diaz*	IX/1980	Civilian	Costa Rica	pending	Assigned as mission specialist to STS 61-C.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Chapman	VI/1967	Civilian	Australia	none	Arthur D. Little, Inc., Cambridge, Mass.
Cleave*	IX/1980	Civilian	New York	pending	Assigned as a mission specialist to STS 61-B.
Coats*	VIII/1978	USN/Cpt.	California	STS 41-D	Assigned to shuttle program.
Collins	III/1963	USAFR/Maj. Gen.	Italy	Gemini 10 Apollo 11	Michael Collins Associates, Washington, D.C.
Conrad	II/1962	USN/(Capt.)	Pennsylvania	Gemini 5 Gemini 11 Apollo 12 Skylab 2	Senior Vice President, McDonnell-Douglas Corporation, Long Beach, Cal.
Cooper	I/1959	USAF/(Col.)	Oklahoma	Mercury-Atlas 9 Gemini 9	President, Vistec, Los Angeles.
Covey*	VIII/1978	USAF/Lt. Col.	Arkansas	pending	Assigned as pilot on STS 51-I.
Creighton*	VIII/1978	USN/Cdr.	Texas	STS 51-G	Assigned to space shuttle program.
Crippen*	VII/1969	USN/Capt.	STS-1	STS-1 STS-7 STS 41-C STS 41-G	Deputy Director of Flight Crew Operations Directorate.
Culbertson*	X/1984	USN/1984	South Carolina	pending	Assigned to space shuttle program.
Cunningham	III/1963	Civilian	Iowa	Apollo 7	Partner with Capital Group, Houston.
Duke	V/1966	USAF/(Col.)	North Carolina	Apollo 16	Christian Lay Ministry in Texas.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Dunbar*	IX/1980	Civilian	Washington	pending	Assigned as a mission specialist on STS 61-A.
Eisele	III/1963	USAF(Col.)	Ohio	Apollo 7	Oppenheimer & Co., Inc., Ft. Lauderdale, Florida.
England*	VI/1967	Civilian	Indiana	pending	Will be a mission specialist on STS 51-F (Spacelab 2).
Engle*	V/1966	USAF/Col.	Kansas	STS-2	Assigned to be commander on STS 51-I.
Evans	V/1966	USN/(Capt.)	Kansas	Apollo 17	Manager, Space Systems Marketing, Sperry Flight Systems, Phoenix, Arizona.
Fabian*	VIII/1978	USAF/Col.	Texas	STS-7 STS 51-G	Assigned to space shuttle program.
Fisher, A.*	VIII/1978	Civilian	New York	STS 51-A	Assigned to space shuttle program.
Fisher, W.*	IX/1980	Civilian	Texas	pending	Assigned as a mission specialist on STS 51-I.
Freeman	III/1963	USAF/Capt.	Pennsylvania	none	Killed in T-38 crash in October 1964.
Fullerton*	VII/1969	USAF/Col.	New York	STS-3	Assigned as commander on STS 51-F.
Gardner, D.*	VIII/1978	USN/Col.	Minnesota	STS 51-A	Assigned to space shuttle program.
Gardner, G.*	IX/1980	USAF/Lt. Col.	Virginia	pending	Assigned as pilot to STS 62-A.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Garriott*	IV/1965	Civilian	Oklahoma	Skylab 3 STS 9	Program scientist for Space Station Program, Johnson Space Center.
Gibson, E.	IV/1965	Civilian	New York	Skylab 4	TRW, Redondo Beach, Cal.
Gibson, R.*	VIII/1978	USN/Cdr.	New York	STS 41-B	Assigned to space shuttle program.
Givens	V/1966	USAF/Maj.	Texas	none	Died in automobile accident in June 1967.
Glenn	I/1959	USMC/(Col.)	Ohio	Mercury-Atlas 6	U.S. Senator from Ohio.
Gordon	III/1963	USN/(Capt.)	Washington	Gemini 11 Apollo 12	Astro Systems and Engineering Los Angeles.
Grabe*	IX/1980	USAF/Lt. Col.	New York	pending	Assigned as pilot to STS 51-J.
Graveline	IV/1965	Civilian	Vermont	none	Private medical practice in Colchester, Vt.
Gregory*	VIII/1978	USAF/Lt. Col.	Washington, D.C.	STS 51-B	Assigned to space shuttle program.
Griggs*	VIII/1978	Civilian	Oregon	STS 51-D	Assigned to space shuttle program.
Grissom	I/1959	USAF/Lt.Col.	Indiana	Mercury-Redstone 4 Gemini 3	Died in Apollo 204 fire.
Gutierrez*	X/1984	USAF/Capt.	New Mexico	pending	Assigned to space shuttle program.
Haise	V/1966	Civilian	Mississippi	Apollo 13	Vice President Grumman Technical Services Inc.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Hammond*	X/1984	USN/Maj.	Georgia	pending	Assigned to space shuttle program.
Hart	VIII/1978	Civilian	Pennsylvania	STS 41-C	Supervisor, Military and Space Application Group, AT&T Bell Labs.
Hartsfield*	VII/1969	USAF/(Col.)	Alabama	STS-4 STS 41-D	Assigned to space shuttle program.
Hauck*	VIII/1978	USN/Capt.	California	STS 51-A	Will be the commander of STS 61-A.
Hawley*	VIII/1978	Civilian	Kansas	STS 41-D	Technical Assistant, Director of Flight Crew Operations.
Henize*	VI/1967	Civilian	Ohio	pending	Will be a mission specialist on STS 51-F (Spacelab 2).
Hilmers*	IX/1980	USMC/Maj.	Iowa	pending	Assigned as mission specialist on STS 51-J.
Hoffman*	VIII/1978	Civilian	New York	STS 51-D	Assigned to space shuttle program.
Holmquest	VI/1967	Civilian	Texas	none	Head, Nuclear Medicine Department, Navasota, Texas.
Irwin	V/1966	USAF/(Col.)	Pennsylvania	Apollo 15	Chairman of the Board, High Flight Foundation, Colorado Springs, Colo.
Ivins*	X/1984	Civilian	Maryland	pending	Assigned to space shuttle program.
Kerwin*	IV/1965	USN/Capt.	Illinois	Skylab 2	Director, Space and Life Sciences, Johnson Space Center.
Lee*	X/1984	USAF/Capt.	Virginia	pending	Assigned to space shuttle program.
Leestma*	IX/1980	USN/Cdr.	Michigan	STS 41-B	Assigned to space shuttle program.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Lenoir	VI/1967	Civilian	Florida	STS-5	Booz-Allen and Hamilton.
Lind*	V/1966	Civilian	Utah	STS 51-B	Assigned to space shuttle program.
Llewellyn	VI/1967	Civilian	Wales	none	Professor, Dept. of Energy Conversion and Mechanical Design, University of South Florida.
Lounge*	IX/1980	Civilian	Colorado	pending	Assigned to STS 51-I.
Lousma	V/1966	USMC/(Col.)	Michigan	Skylab 3 STS-3	Consultant in Ann Arbor, Michigan.
Lovell	II/1962	USN/(Capt.)	Ohio	Gemini 7 Gemini 12 Apollo 8 Apollo 13	Executive Vice President, Centel Business Systems, Houston, Texas.
Low*	X/1984	Civilian	Ohio	pending	Assigned to space shuttle program.
Lucid*	VIII/1978	Civilian	Shanghai	STS 51-G	Assigned to space shuttle program.
Mattingly	V/1966	USN/Commodore	Illinois	Apollo 16 STS-4 STS 51-C	Director, Space Program, Space and Naval Systems Command.
McBride*	VIII/1978	USN/Cdr.	West Virginia	STS 41-G	Assigned to space shuttle program.
McCandless*	V/1966	USN/Capt.	Massachusetts	STS 41-B	Assigned to space shuttle program.
McCulley*	X/1984	USN/Cdr.	California	pending	Assigned to space shuttle program.

TABLE 1-5 (cont.)

Name	Chosen	(Retired)	Native State	Flights	Comments
McDivitt	II/1962	USAF/(Brig.Gen.)	Illinois	Gemini 4 Apollo 9	Executive Vice President, Defense Electronics Operations, Rockwell.
McNair*	VIII/1978	Civilian	South Carolina	STS 41-B	Assigned to space shuttle program.
Michel	IV/1965	Civilian	Wisconsin	none	Professor, Rice University, Houston, Texas.
Mitchell	V/1966	USN/(Capt.)	Texas	Apollo 14	Chairman, Mitchell Communications Co., Florida.
Mullane*	VIII/1978	USAF/Col.	Texas	STS 41-D	Will be a mission specialist on future DOD mission.
Musgrave*	VI/1967	Civilian	Massachusetts	STS-6	Will be a mission specialist on STS 51-F.
Nagel*	VIII/1978	USAF/Lt. Col.	Illinois	STS 51-G	Will be pilot on STS 61-A.
Nelson*	VIII/1978	Civilian	Iowa	STS 41-C	Will be a mission specialist on STS 61-C.
O'Connor*	IX/1980	USMC/Lt. Col.	California	pending	Assigned as pilot for STS 61-B.
O'Leary	VI/1967	Civilian	Massachusetts	none	Senior scientist, Science Applications International Corp.
Onizuka*	VIII/1978	USAF/Lt. Col.	Hawaii	STS 51-C	Assigned to space shuttle program.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Overmyer*	VII/1969	USMC/Col.	Ohio	STS-5 STS 51-B	Assigned to space shuttle program.
Parker*	VI/1967	Civilian	New York	STS-9	Assigned to space shuttle program.
Peterson	VII/1969	USAF/(Col.)	Mississippi	STS-6	President, Aerospace Operation Consultants, Inc.
Pogue	V/1966	USAF/(Col.)	Oklahoma	Skylab 4	William Pogue Associates, Inc. Arkansas.
Resnik*	VIII/1978	Civilian	Ohio	STS 41-D	Assigned to space shuttle program.
Richards*	IX/1980	USN/Cdr.	Florida	pending	Assigned as pilot on STS 61-E.
Ride*	VIII/1978	Civilian	California	STS-7 STS 41-G	Assigned to space shuttle program.
Roosa	V/1966	USAF/(Col.)	Colorado	Apollo 14	President, Gulf Coast/Coors.
Ross*	IX/1980	USAF/Maj.	Indiana	pending	Assigned as mission specialist on STS 61-B.
Schirra	I/1959	USN/(Capt.)	New Jersey	Mercury-Atlas 8 Gemini 6 Apollo 7	Consultant, Sante Fe, California.
Schmitt	IV/1965	Civilian	New Mexico	Apollo 17	Member of Foreign Intelligence Advisory Board; National.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Schweickart	III/1963	Civilian	New Jersey	Apollo 9	Visiting scientist, Massachusetts Institute of Technology.
Scobee*	VIII/1978	USAF/(Maj.)	Washington	STS 41-C	Will be the commander of STS 51-L.
Scott	III/1963	USAF/(Col.)	Texas	Gemini 8 Apollo 9 Apollo 15	President, Scott Science and Technology, Inc., Los Angeles, California.
Seddon*	VIII/1978	Civilian	Tennessee	STS 51-D	Assigned to space shuttle program.
See	II/1962	Civilian	Texas	none	Killed in T-38 crash in February 1966.
Shaw*	VIII/1978	USAF/Maj.	Michigan	STS-9	Will be the commander of STS 61-B.
Shepard, A.	I/1959	USN/(Rear Adm.)	New Hampshire	Mercury-Redstone 3 Apollo 14	President, Windward Coors Company, Deer Park, Texas.
Shepard, W.*	X/1984	USN/Lt. Cdr.	Tennessee	pending	Assigned to space shuttle program.
Shriver*	VIII/1978	USAF/Col.	Iowa	STS 51-C	Assigned to space shuttle program.
Shulman*	X/1984	Civilian	North Carolina	pending	Assigned to space shuttle program.
Slayton	I/1959	USAF/(Maj.)	Wisconsin	Apollo-Soyuz	Consultant in Houston, Texas.
Smith*	IX/1980	USN/Cdr.	North Carolina	pending	Assigned to STS 51-L.

C. 1985 ASTRONAUT CANDIDATES

NASA announced the most recent group of astronaut candidates on June 4, 1985. Thirteen candidates were selected, six pilots and seven mission specialists. The pilots include: Lt. Cdr. Michael Baker, Maj. Robert Cabana, Capt. Brian Duffy, Maj. Terrence Henricks, Stephen Oswald, and Lt. Cdr. Stephen Thorne. The mission specialists in the 1985 candidate group are: Dr. Jerome Apt, Capt. Charles Gemar, Dr. Linda Godwin, Richard Hieb, Tamara Jernigan, Capt. Carl Meade, and Lt. Pierre Thuot. Limited biographical information was available on this newest group at the time of publication. However, NASA had released the following brief biographies.

Jerome Apt; Ph.D.; born April 28, 1949, Springfield, Massachusetts; BA, physics, Harvard College, 1971; Ph.D., physics, Massachusetts Institute of Technology, 1976; present position: Payload Officer, Operations Division, Johnson Space Center, Houston, Texas.

Michael A. Baker; Lt. Cmdr., USN; born October 27, 1953, Memphis, Tennessee; BS, aerospace engineering, University of Texas, 1975; present position: Fixed Wing Test Pilot Tutor, Empire Test Pilot's School, Boscombe Downs, Salisbury, Wiltshire, United Kingdom.

Robert D. Cabana; Maj., USMC; born January 23, 1949, Minneapolis, Minnesota; BS, mathematics, U.S. Naval Academy, 1971; present position: Assistant Operations Officer, Marine Aircraft Group 12, Marine Corps Air Station, Iwakuhi, Japan.

Brian Duffy; Capt., USAF; born June 20, 1953, Boston Massachusetts; BS, mathematics, U.S. Air Force Academy, 1975; MS, systems management, University of Southern California, 1981; present position: Director of F-15 Tests, 3247th Test Squadron, Eglin AFB, Florida.

Charles D. Gemar; Capt., USA; born August 4, 1955, Yankton, South Dakota; BS, engineering, U.S. Military Academy, 1979; present position: Chief, Operations Branch, Command Aviation Office, Hunter Army Airfield, Georgia.

Linda M. Godwin; Ph.D.; born July 2, 1952, Cape Girardeau, Missouri; BS, mathematics & physics, S.E. Missouri St., 1974; MS, physics, University of Missouri, 1976; Ph.D., physics, University of Missouri, 1980; present position: Payload Officer, Operations Division, Johnson Space Center, Houston, Texas.

Terence T. Henricks; Maj., USAF; born July 5, 1952, Bryan, Ohio; BS, civil engineering, U.S. Air Force Academy, 1974; Masters of Public Admin., Golden Gate University, 1982; present position: F-16 Test Pilot, 57th Fighter Weapons Wing (TAC), Edwards AFB, California.

Richard J. Hieb; born September 21, 1955, Jamestown, North Dakota; BA, math and physics, N.W. Nazarene College, 1977; MS, aerospace engineering, University of Colorado, 1979; present position: Flight Activities Officer, Operations Division, Johnson Space Center, Houston, Texas.

Tamara E. Jernigan; born May 7, 1959, Chattanooga, Tennessee; BS, physics, Stanford University, 1981; MS, engineering science, Stanford University, 1983; MS, astronomy, University of California-Berkeley, 1985; present position: Research Scientist, Ames Research Center, Moffett Field; California.

Carl J. Meade: Capt., USAF; born November 16, 1950, Chanute AFB, Illinois; BS, electronics engineering, University of Texas, 1973; MS, electronics engineering, California Institute of Technology, 1975; present position: Experimental Test Pilot Instructor, U.S. Air Force Test Pilot School, Edwards AFB, California.

Stephen S. Oswald: born June 30, 1951, Seattle, Washington; BS, aerospace engineering, U.S. Naval Academy, 1973; present position: Aerospace Engineer and Pilot, Aircraft Operations Division, Johnson Space Center, Houston, Texas.

Stephen D. Thorne: Lt. Cmdr., USN; born February 11, 1953, Frankfurt-on-Main, West Germany; BS, engineering, U.S. Naval Academy, 1975; present position: Squadron Aviation Safety Officer, STRKFITRON 132, Naval Air Station, Cecil Field, Florida.

Pierre J. Thuot, Lt., USN; born May 19, 1955; Groton, Connecticut; BS, physics, U.S. Naval Academy, 1977; MS Systems Management, University of Southern California, 1985; present position: Airborne Systems Flight Instructor, U.S. Naval Test Pilot School, Patuxent River, Maryland.

CHAPTER TWO

U.S. PAYLOAD SPECIALISTS AND PASSENGERS

In addition to the professional astronauts that NASA will fly on the space shuttle, additional people will be making flights. In general they fall into two categories, payload specialists and passengers.

Payload specialists are individuals with specific expertise connected with a payload to be flown on a shuttle mission. They are selected for their knowledge, and receive 160 hours of training (at the user's expense) before the flight, reporting to Johnson Space Center no more than six months and no less than three months prior to the flight. Payload specialists for several Spacelab missions have been selected and are included here (with the exception of foreign payload specialists who are discussed in chapter five).

In 1982, NASA revised its rules concerning payload specialists to enable more individuals to fly on the shuttle. Previously, a customer had to purchase at least one-half of the shuttle cargo bay's volume in order to qualify to send someone along with the payload. Now, they only have to be "major" user of a shuttle flight. Thus, representatives from companies flying materials processing experiments or communications satellites, for example, will be able to send one of their own employees along. This also applies to foreign users of the shuttle.

In addition to the NASA payload specialists, the Department of Defense (DOD) has its own pool of payload specialists to fly on DOD-dedicated shuttle missions. The Air Force has selected 27 officers for its "Manned Spaceflight Engineer" program. They are assigned to Air Force Systems Command Space Division at Los Angeles Air Force Station, California, but have not yet been publicly identified. According to the Air Force, the MSE program is a developmental engineering program to help DOD perfect its design, development, and on-orbit operation of Defense Department cargo aboard the space shuttle. The Air Force states that at least one of its payload specialists will participate in each DOD-dedicated shuttle flight in order to apply the capabilities of the shuttle to the needs of military satellite programs, and to identify and implement changes, when needed, in the shuttle or military payloads to enhance the mission.

The passenger category includes individuals who will fly on the shuttle simply as passengers, with no connection to a particular payload. NASA hopes to make opportunities available to many individual citizens so they can experience space flight firsthand. Senator Jake Garn was the first passenger, serving as a congressional observer on STS 51-D in April 1985. NASA selected the second passenger, Sharon Christa McAnliffe, a teacher, just before this volume went to press.

Some biographies in this section are not complete because NASA cannot release the information until they receive signed release forms.

A. U.S. PAYLOAD SPECIALISTS BIOGRAPHIES

Loren Wilbur Acton; civilian; born March 7, 1936, Lewiston, Montana; married, two children.

Received bachelor of science from Montana State University (1959) and a doctorate from the University of California (1965). He is the senior staff scientist with the Space Sciences Laboratory, Lockheed Palo Alto Research Laboratory, specializing in studies of the Sun and other celestial objects. He is one of two payload specialists for Spacelab 2.

John-David Bartoe; civilian; born November 17, 1944, Abingdon, Pennsylvania; married, three children.

Received bachelor of science from Lehigh University (1966); master of science from Georgetown University (1974); and a doctorate from Georgetown (1976). He is a supervisory astrophysicist with the Naval Research Laboratory in Washington, D.C. and is a co-investigator for Spacelab 2.

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L. William Butterworth; civilian; born July 17, 1948, Casper, Wyoming; married.

Received bachelor of science in engineering (1970) and a master of science in mechanical engineering (1971) from the California Institute of Technology. He has worked at the Jet Propulsion Laboratory and Hughes Aircraft Company. In 1974, he joined the staff of NASA's Pioneer Venus Program, and, following its successful completion, joined the Galileo Probe Program. Currently, he is the Assistant Program Manager for the Galileo Probe. Mr. Butterworth was selected as a payload specialist candidate in July 1984 and was the back-up for the STS 51-D flight.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Spring*	IX/1980	USA/Lt. Col.	Connecticut	pending	Assigned as mission specialist to STS 61-B.
Springer*	IX/1980	USMC/Col.	Missouri	pending	Assigned to space shuttle program.
Stafford	II/1962	USAF/(Lt. Gen.)	Oklahoma	Gemini 6 Gemini 9 Apollo 10 Apollo-Soyuz	Consultant, Defense Technology, Oklahoma City, Oklahoma.
Stewart*	VIII/1978	USA/Col.	Washington, D.C.	STS 41-B	Will be a mission specialist on STS 51-J.
Sullivan*	VIII/1978	Civilian	New Jersey	STS 41-G	Assigned to space shuttle program.
Swigert	V/1966	Civilian	Colorado	Apollo 13	Died of cancer, December 27, 1982.
Thagard*	VIII/1978	Civilian	Florida	STS-7 STS 51-B	Assigned to space shuttle program.
Thornton, K.*	X/1984	Civilian	Alabama	pending	Assigned to space shuttle program.
Thornton, W.*	VI/1967	Civilian	North Carolina	STS-8 STS 51-B	Assigned to space shuttle program.
Truly	VII/1969	USN/Commodore	Mississippi	STS-2 STS-8	Commander, Naval Space Command.
van Hoften*	VIII/1978	Civilian	California	STS 41-C	Will be a mission specialist on STS 51-I.

TABLE 1-5 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Flights	Comments
Veach*	X/1984	Civilian	Illinois	pending	Assigned to space shuttle program.
Walker*	VIII/1978	USN/Capt.	Georgia	STS 51-A	Assigned to space shuttle program.
Weitz*	V/1966	USN/(Capt.)	Pennsylvania	Skylab 2 STS-6	Assigned to space shuttle program.
Wetherbee*	X/1984	USN/Lt.	New York	pending	Assigned to space shuttle program.
White	II/1962	USAF/Lt.Col.	Texas	Gemini 4	Died in Apollo 204 fire.
Williams, C.	III/1963	USMC/Maj.	Alabama	none	Killed in T-38 crash in October 1967.
Williams, D.*	VIII/1978	USN/Cdr.	Indiana	STS 41-D	Assigned to space shuttle program.
Worden	V/1966	USAF/(Lt.Col.)	Michigan	Apollo 15	President, Air 100.
Young*	II/1962	USN/(Capt.)	California	Gemini 3 Gemini 10 Apollo 10 Apollo 16 STS-1 STS-9	Assigned to space shuttle program.

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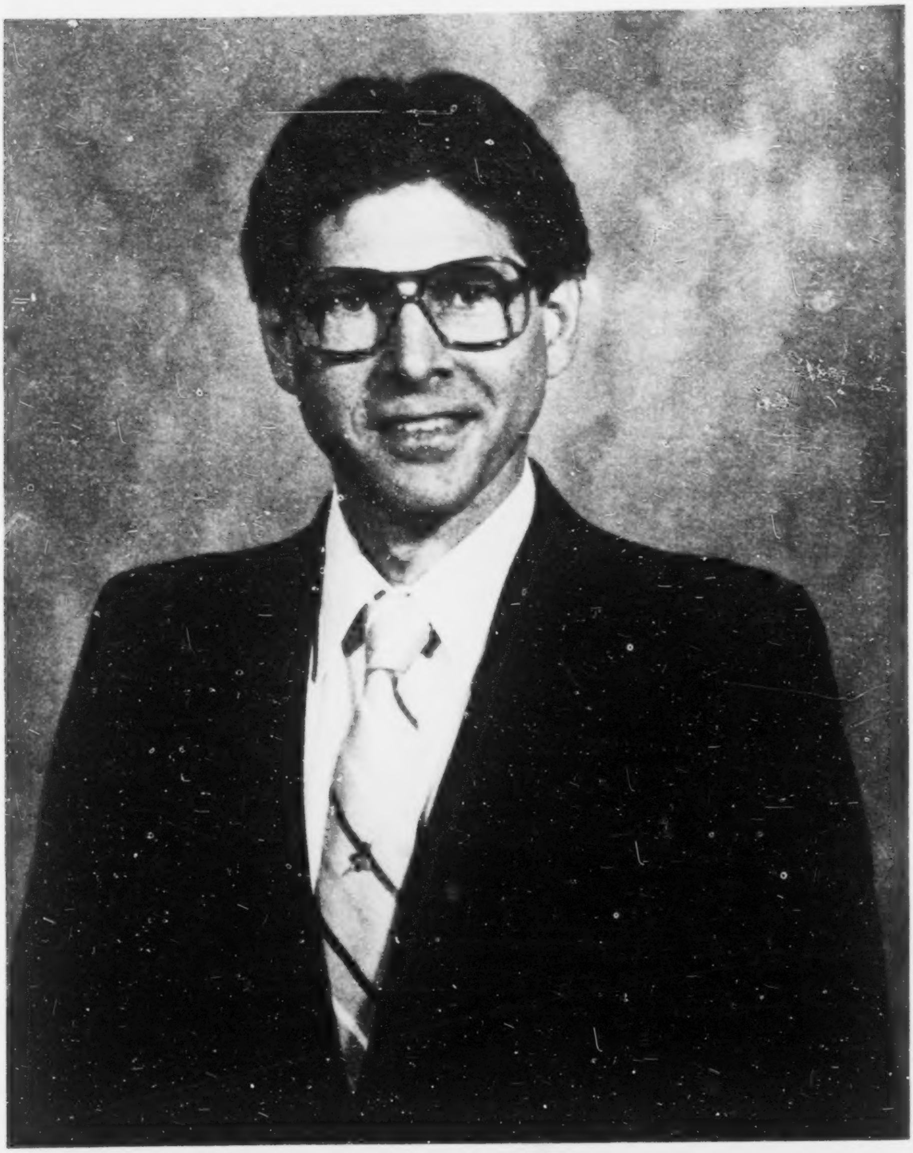
*Active status.

NO PHOTOGRAPH AVAILABLE

Steven L. Cunningham; civilian; born September 10, 1945, Renton, Washington; married, three children.

Received bachelor of science in physics from the University of Denver (1967); master of science (1969) and doctorate (1971) in physics from the University of Nebraska. He did post-doctoral work at the University of California (Irvine) and was a visiting associate at the California Institute of Technology (Pasadena). In 1977, he joined Hughes Aircraft Company as a senior staff physicist, working in the Space and Communications Group, the NASA division (for Landsat), and for the military division. Dr. Cunningham was selected by Hughes as an alternate payload specialist in June 1984, to accompany the launch of Syncom IV on STS 51-I.



Samuel T. Durrance; civilian; born September 17, 1943, Tallahassee, Florida; married, one child.

Received bachelor of science (1972) and master of science (1974) in physics from California State University (Los Angeles) and a doctorate in astro-geophysics from the University of Colorado (1980). He is an associate research scientist in the Department of Physics and Astronomy at Johns Hopkins University and assistant project scientist for the Hopkins Ultraviolet Telescope. Dr. Durrance has participated in the design, construction, calibration, integration, and launch of telescope/UV spectrometer payloads to study the origin and evolution of the solar system and other planetary systems and the origin of life in the universe. Dr. Durrance is a payload specialist in training to operate Astro experiments, a series of Spacelab astronomy missions scheduled to begin in March 1986.

Millie Hughes-Fulford; civilian; born in Mineral Wells, Texas; married, one child.

Received bachelor of science in chemistry and biology, Tarleton State University (1968); doctorate in chemistry, Texas Women's University (1972). Since 1973, she has been at the V.A. Medical Center in San Francisco and is an associate professor of biochemistry at the University of California Medical Center in San Francisco. Dr. Hughes-Fulford is assigned to the second Spacelab dedicated to life sciences.

Andrew Gaffney; civilian; married, two children.

Received bachelor of arts degree, University of California, Berkeley (1968); and doctor of medicine, University of New Mexico (1972). He is an assistant professor of medicine and cardiology at the University of Texas Health Science Center, Southwestern Medical School, in Dallas, Texas, and Director of Echocardiography. Dr. Gaffney is assigned as a payload specialist aboard Spacelab 4, the first Spacelab mission dedicated to life sciences.

Jake Garn; civilian; born October 12, 1932, Richfield, Utah; married, six children.

Received bachelor of science degree in business and finance, University of Utah. He was formerly an insurance executive and Navy pilot. He was elected to a second term in the Senate in 1980. Garn was the first passenger on the space shuttle, flying on STS 51-D as a congressional observer.

ISA
HUGHES
NASA

Gregory B. Jarvis.

In 1973, Mr. Jarvis joined Hughes Aircraft Company's Space and Communications group, working on the Leasat program. He was selected as a payload specialist candidate in July 1984 and is assigned to STS 51-I.

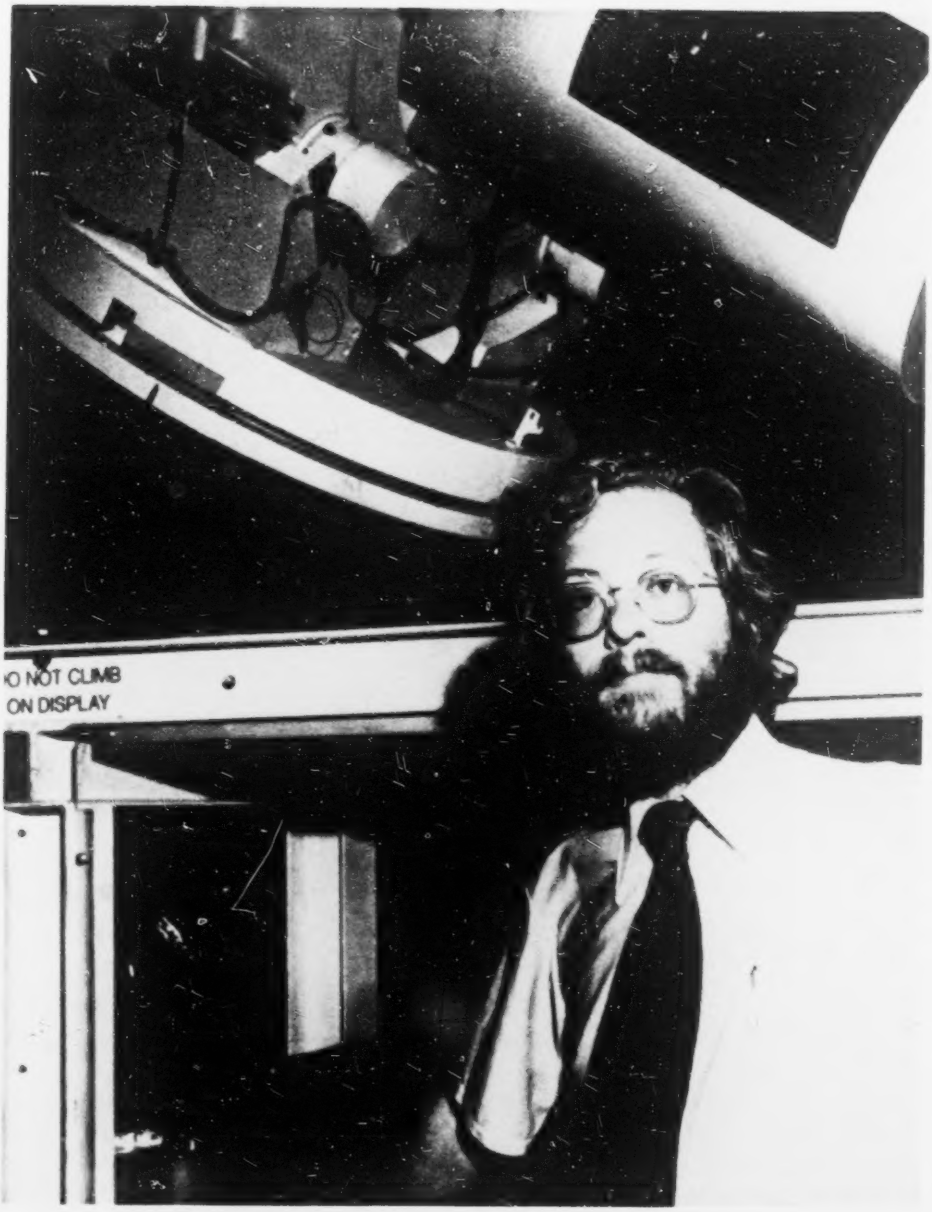
Mary Helen Johnston.

Dr. Johnston was an alternate payload specialist for Spacelab 3, which flew on STS 51-B.

NO PHOTOGRAPH AVAILABLE

John H. Konrad; civilian; born March 12, 1949, Pontiac, Illinois; married, two children.

Received bachelor of science in aeronautical and astronautical engineering Oklahoma State University (1971), and doctorate in fluid mechanics, California Institute of Technology (1976). He joined Hughes Aircraft in 1976, and was the assistant system engineering manager for Telstar III and Intelsat VI. He is currently a project manager at Hughes and is assigned as a payload specialist to STS 51-I.



Michael L. Lampton; civilian; born March 1, 1941, Williamsport, Pennsylvania; married, one child.

Received bachelor of science in physics from the California Institute of Technology (1962) and a doctorate from the University of California at Berkeley (1967). He is a research physicist at the Space Sciences Laboratory at the University of California at Berkeley, specializing in X-ray and UV astronomy, space physics, and optical and electronic engineering. Dr. Lampton was selected to train for the Spacelab 1 mission in June 1978; and in May 1984 for the EOM-1 mission, a joint NASA-ESA mission.

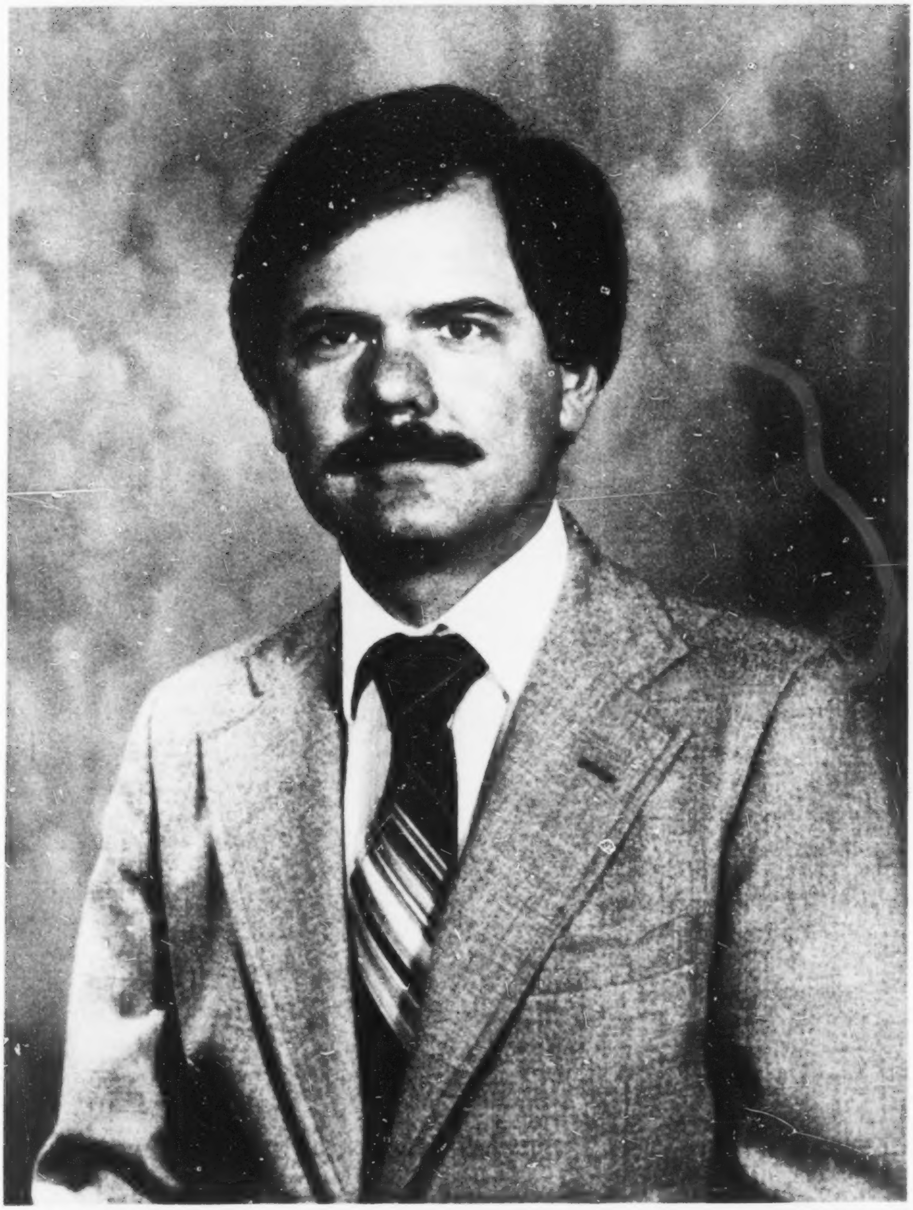
NO PHOTOGRAPH AVAILABLE

Byron Kurt Lichtenberg; civilian; born February 19, 1948, Stroudsberg, Pennsylvania; married, two children.

Received bachelor of science in electrical engineering from Brown University (1969); master of science in mechanical engineering (1975) and doctorate in biomedical engineering (1979) from MIT. Served as a captain in the U.S. Air Force from 1969–1973, including a tour of duty in Vietnam, and is currently a major in the Massachusetts Air National Guard. He is president of Payload Systems, Inc., an engineering consulting firm. Dr. Lichtenberg flew as one of the first two payload specialists on Spacelab 1, and has been selected to fly on the shuttle with EOM–1, a joint ESA–NASA facility built to make environmental observations of the Earth.

Kenneth H. Nordsieck; civilian; born February 19, 1946, Santa Barbara, California; single.

Received bachelor of science in astronomy, California Institute of Technology (1967); and doctorate, University of California (1972). He is an associate professor at Washburn Observatory, University of Wisconsin. He is a co-investigator for the Wisconsin Ultraviolet Photopolarimetry Experiment, one of the experiments aboard Astro, a series of Spacelab astronomy missions scheduled to begin in March 1986.



Ronald A. Parise; civilian; born May 24, 1951, Warren, Ohio; married, one child.

Received bachelor of science in physics, Youngstown State University (1973); master of science (1977) and doctorate (1979) in astronomy, University of Florida. He is manager of the Advanced Astronomy Programs Section, Computer Sciences Corporation, in Silver Spring, Maryland. He is a member of the research team for the Ultraviolet Imaging Telescope, scheduled to fly on Astro, a series of Spacelab astronomy missions, scheduled to begin in March 1986.

Gary E. Payton; Major, USAF. Major Payton flew on STS 51-C, as the first military payload specialist.

Robert Ward Phillips; civilian; married, four children.

Received doctor of veterinary medicine (1961), Colorado State University; and doctorate, University of California (1964). He is a professor of physiology and nutrition at Colorado State. Dr. Phillips is a payload specialist for Spacelab 4.

Dianne Kasnic Prinz; civilian; born September 29, 1938, Economy, Pennsylvania; married.

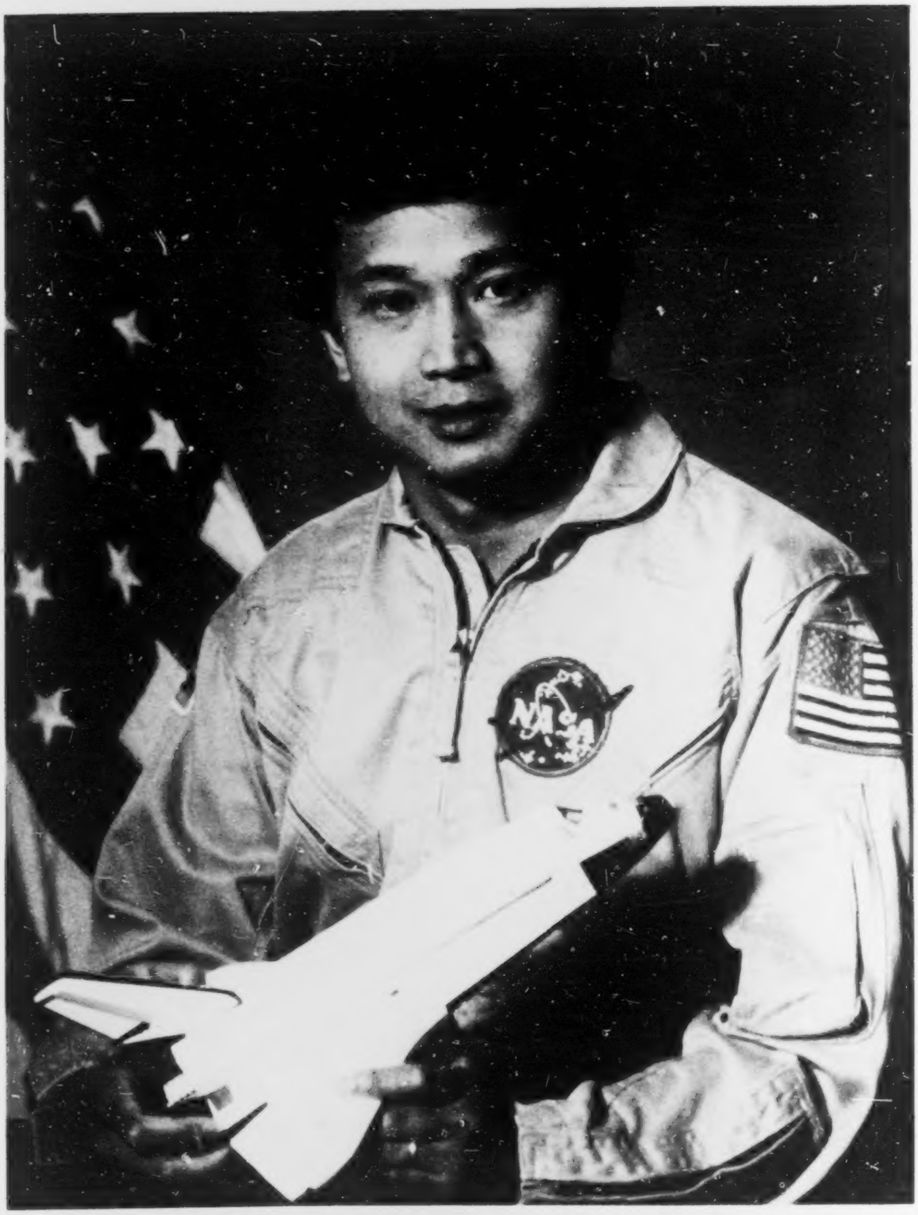
Received bachelor of science, University of Pittsburgh (1960), and doctorate, Johns Hopkins University (1967). She is a research physicist with the Naval Research Laboratory in Washington, D.C., specializing in solar-terrestrial relationships and the design of optical instrumentation. She is an alternate payload specialist for Spacelab 2, and will assist as a troubleshooter in the Payload Operations Control Center at Johnson SFC during the flight.

Paul Desmond Scully-Power; civilian; born May 28, 1944, Sydney, Australia (became a U.S. citizen in 1982); married, six children.

Bachelor of science, post graduate diploma of education, University of Sidney, 1966. Established and served as head of first oceanographic group in Royal Australian Navy, 1967–1972. While an exchange scientist with the U.S. Navy, he was invited to assist the Earth Observations team on Skylab, and has worked in space oceanography for each manned spacecraft mission since then. Scully-Power served as principle foreign investigator for the Heat Capacity Mapping Mission. Since emigrating to the United States, he has served as a senior scientist and technical specialist at the Naval Underwater Systems Center. He was a payload specialist on STS 41–G.

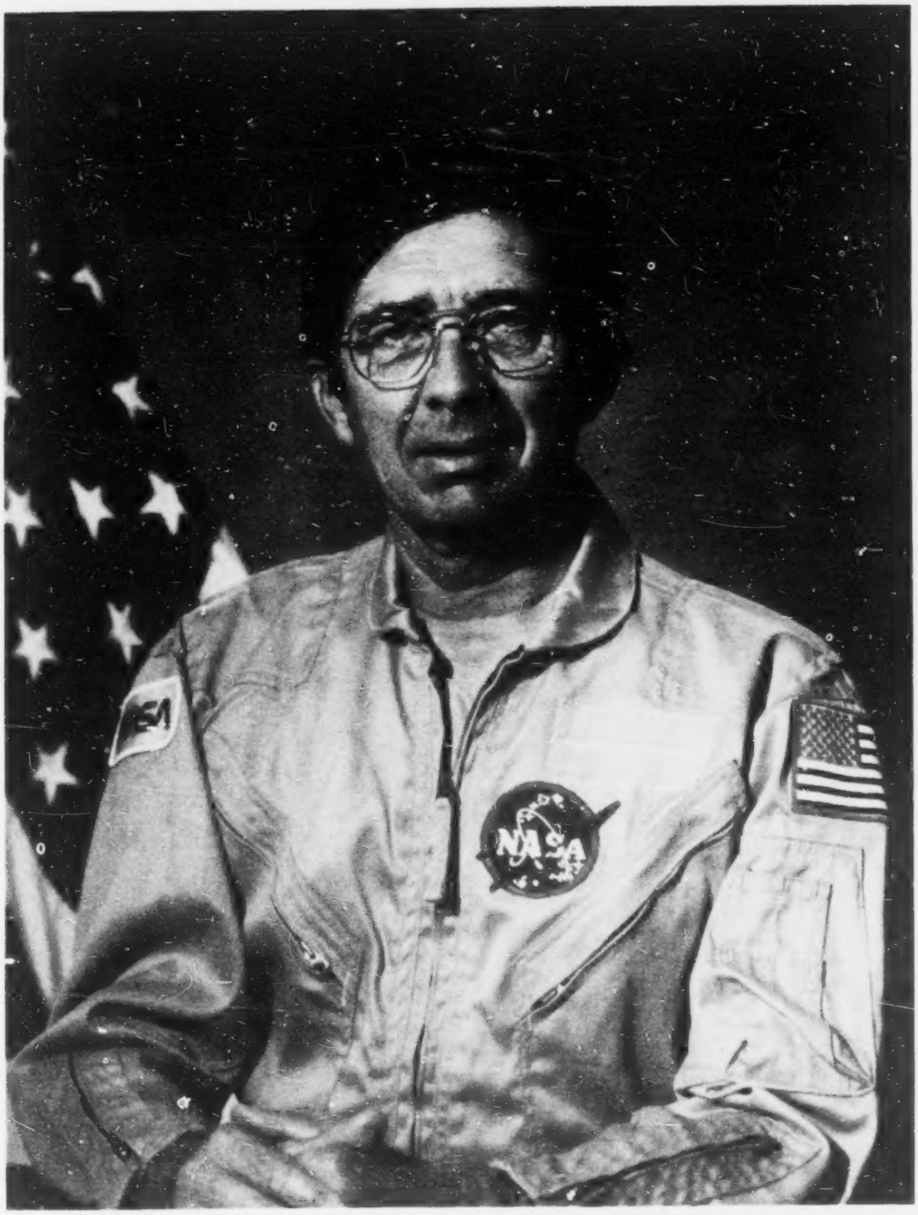
George W. Simon; civilian; born April 22, 1934, Frankfurt, Germany; married, three children.

Received bachelor of arts from Grinnell College (1955); master of science (1961) and doctorate (1963) from the California Institute of Technology; and a master of business administration from the University of Utah (1976). He is senior scientist of the Space Physics Division, Air Force Geophysics Laboratory at the National Solar Observatory in Sunspot, New Mexico. Dr. Simon is an alternate payload specialist for Spacelab 2, and will assist in Johnson's Payload Operations Control Center during the flight.



Eugene H. Trinh; civilian; born September 14, 1950, Saigon, South Vietnam; married.

Received bachelor of science in engineering science, Columbia University (1972); master of science (1974), master of philosophy (1976), and doctorate in applied physics (1978) from Yale University. He joined NASA's Jet Propulsion Laboratory in 1979, where he is currently a physicist, specializing in fluid mechanics, using acoustic levitation apparatus in his research on free drops in normal gravity and zero gravity. Dr. Trinh was an alternate for Spacelab 3.



Lodewijk van den Berg; born in Sluiskil, Netherlands.
Dr. van den Berg is now a chemical engineer at EE&G Corp., Goleta, California. He is training as a Spacelab payload specialist.

NASA
CHARLIE WALKER
EOS

Charles David Walker; civilian; born August 29, 1948, Bedford, Indiana; married.

Received bachelor of science in aeronautical and astronautical engineering, Purdue University in 1971. He worked as a design engineer at Bendix Aerospace Company and as a project engineer at Naval Sea Systems Command Engineering Center. Walker joined McDonnell Douglas in 1977 as a test engineer for the shuttle's aft propulsion subsystem. He currently is chief test engineer for the Electrophoresis Operations in Space (EOS) and was responsible for EOS on STS 41-D and 51-D.

Taylor G. Wang; civilian; born June 16, 1940, Shanghai, China; married, two children.

Received bachelor of science (1967), masters (1968), and doctorate (1971) in physics in 1971 from the University of California at Los Angeles. He joined the Jet Propulsion Laboratory in 1972 and is currently program manager for materials processing in space, and has been responsible for development of containerless processing in space. Dr. Wang flew on STS 15–B (Spacelab 3) as the principle investigator for several studies including drop and liquid bubble dynamics and containerless processing.

Bill Alvin Williams; civilian.

Received bachelor of science in physiology, University at Berkeley (1963); master of science and doctorate in physiology, University of Illinois (1968). He is currently a research scientist/group leader at the Environmental Protection Agency. Dr. Williams was chosen as a payload specialist for Spacelab 4. He has, however, resigned from the program.

NO PHOTOGRAPH AVAILABLE

Robert Jackson Wood; civilian; born June 26, 1957, Fitchburg, Massachusetts; married, one child.

Received bachelor of science in physics, Ohio University (1975); master of science in physics, Massachusetts Institute of Technology (1980). At McDonnell Douglas, he participated in the design of remote control systems for large scale pharmaceutical processing using electrophoresis operations in space (EOS) on the shuttle, and was the architect of the EOS computer network. Wood has been a Mission Control support engineer for all EOS flights and is payload specialist.

CHAPTER THREE

THE X-15, X-20 DYNA-SOAR, AND MANNED ORBITING LABORATORY PROGRAMS

In addition to the NASA astronaut program, the United States had three other programs in which participants could achieve the astronaut rating, using the standard definition of having flown above 80 kilometers (50 miles or 264,000 feet). These were the NASA/Navy/Air Force X-15 program from 1952-1969; the Air Force/NASA X-20 Dyna-Soar program from 1956-1963; and the Department of Defense Manned Orbiting Laboratory program from 1963-1969. Only the X-15 actually proceeded through the flight testing phase before the programs were each cancelled in turn.

A. X-15

The X-15 was a sophisticated research aircraft that would fly at hypersonic speeds (over 7,200 kilometers per hour or 4,500 miles per hour) as well as attain high altitudes (over 107 kilometers or 350,000 feet) to provide inflight information and data on aerodynamics, structures, flight controls and the physiological aspects of high-speed, high-altitude flight. The joint NASA/Navy/Air Force project had its origins in the summer of 1952 when the National Advisory Committee for Aeronautics (NACA, the predecessor agency to NASA) directed its laboratories to study concepts of very high altitude supersonic manned flight, the problems associated with it and methods for fully exploring the problem areas.

The flight research program for the X-15 consisted of a series of progressive steps to higher speeds and higher altitudes to obtain new data or confirm theoretical or wind tunnel data on characteristics of an airplane performing in a very advanced regime. The first X-15 was completed and moved to Edwards Air Force Base in October 1958. On June 8, 1959, pilot Scott Crossfield made the first powerless glide flight in the plane. Three months later he completed the first powered flight.

During the nine years the X-15 was flown (1959-1968), 199 flights were completed. The highest altitude acheived was 354,200 feet (108 kilometers) by Joseph Walker on August 22, 1963, while the fastest speed recorded was mach 6.70 (4,520 miles per hour or 7,270 kilometers per hour) by Pete Knight on October 3, 1967.

Of the twelve men who flew the X-15 (Adams, Armstrong, Crossfield, Dana, Engle, Knight, McKay, Petersen, Rushworth, Thompson, Walker and White), eight (Adams, Dana, Engle, Knight, McKay, Rushworth, Walker and White) achieved the astronaut rating by flying above 80 kilometers. One pilot, Adams, was killed while flying the X-15.

B. X-20 DYNA-SOAR

The Dyna-Soar was a joint Air Force/NASA project aimed at development of a small, piloted glider which could be boosted into space flight and which would be capable of maneuverable reentry from orbit to a conventional controlled landing. Primarily a manned military space research vehicle, the Dyna-Soar was designed to achieve orbital velocity and thereby be able to explore the problems and conditions of hypersonic flight beyond the range of the X-15.

The project was initiated in 1956, and six pilots were chosen on September 20, 1962 (Crews, Gordon, Knight, Rogers, Thompson and Wood), but when the Manned Orbiting Laboratory program began in 1963, the Air Force and NASA decided to terminate the X-20. It had limited utility as an in-space test facility, and the Defense Department believed that exploration of the hypersonic flight regime and development of maneuverable reentry and recovery techniques could be more economically conducted in a program of unmanned lifting reentry vehicles.

C. MANNED ORBITING LABORATORY (MOL)

The Department of Defense Manned Orbiting Laboratory program originated in 1963. The program was first conceived as a means to determine the military usefulness of man in space. After the initiation of the MOL program, study by the Air Force and Navy resulted in broader program goals and a wider definition of areas of principal interest. MOL was to: (a) learn more about what man is able to do in space and how that ability could be used for defense purposes; (b) develop the technology and equipment which would help advance manned and unmanned space flight; and (c) experiment with this technology and equipment.

MOL was to be equipped to accommodate two men in orbit for thirty days. The Department of Defense selected a total of seventeen astronauts for the program. All of these men were military test pilots and graduates of the Aerospace Research Pilot School at Edwards Air Force Base, California. They were selected in three groups: Group I, November 12, 1965, 8 chosen (Adams, Crews, Finley, Lawyer, Macleay, Neubeck, Taylor and Truly); Group II, June 17, 1966, 5 chosen (Bobko, Crippen, Fullerton, Hartsfield, and Overmyer); and Group III, June 30, 1967, 4 chosen (Abrahamson, Herres, Lawrence, and Peterson).

The Department of Defense cancelled the MOL program on June 10, 1969. Among the contributing factors were the immediate need to significantly reduce the DOD budget and the continuing large annual investments which would have been necessary to sustain program progress. DOD tried to assure useful application of a significant portion of the investment in MOL by transferring MOL technology and hardware to laboratories, NASA, and other government agencies. In addition, some of the MOL astronauts transferred to the NASA astronaut group (Bobko, Crippen, Fullerton, Overmyer, Peterson and Truly).

D. BIOGRAPHIES OF X-15, X-20, AND MOL ASTRONAUTS

James A. Abrahamson, *MOL;* Lieutenant General, USAF; born May 19, 1933, Inglewood, California; married, two children.

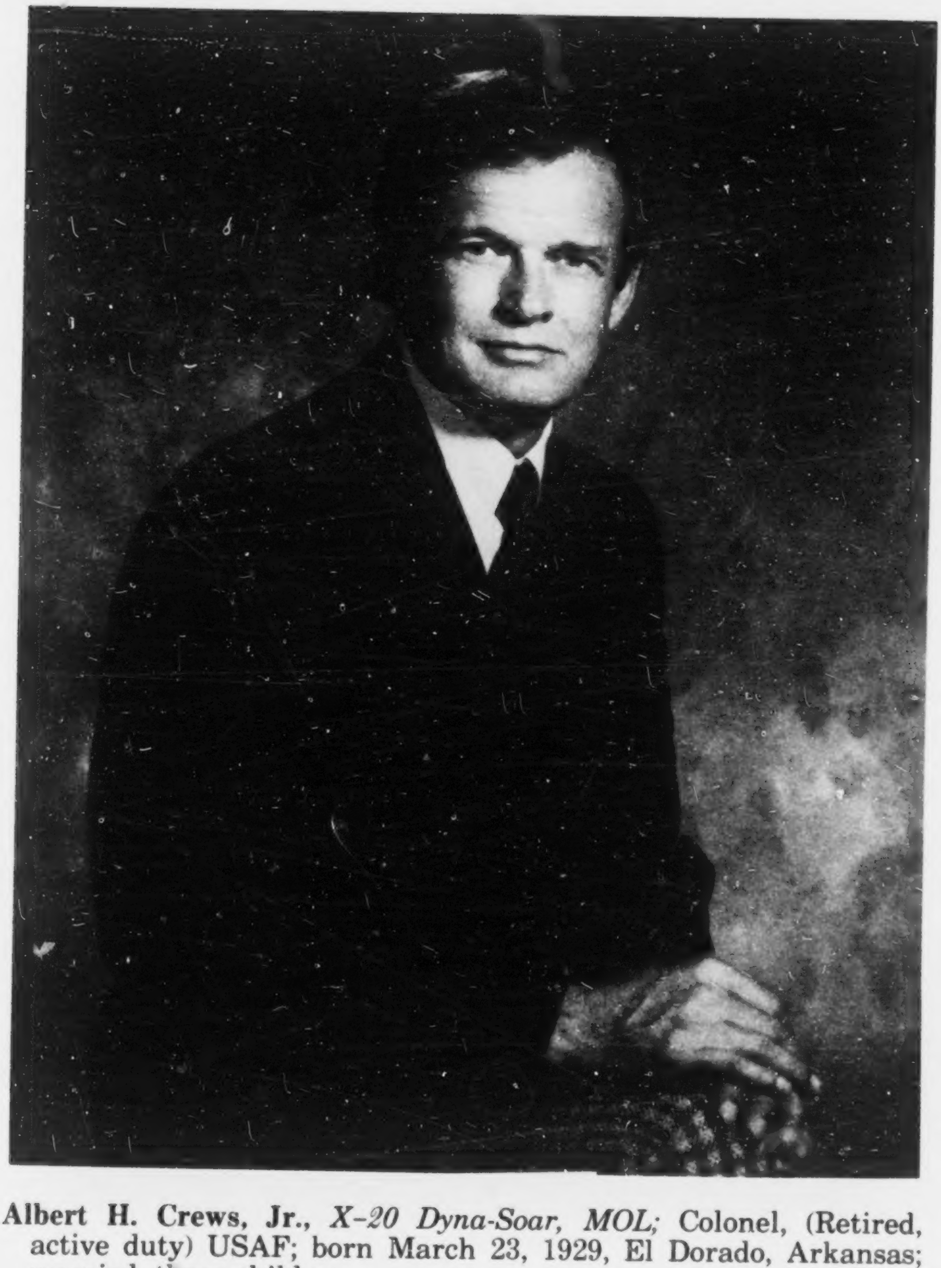
Received bachelor of science degree in aeronautical engineering from the Massachusetts Institute of Technology, master of science in aerospace engineering from the University of Oklahoma, and was chosen for the MOL Program in 1967 (Group III). After MOL was cancelled, he became a staff member of the National Aeronautics and Space Council. When the Council was dissolved in 1973, he returned to active duty with the Air Force and became Inspector General, Air Force Systems Command at Andrews Air Force Base, Maryland. He was the Deputy Chief of Staff, Air Force Systems Command, Wright Patterson Air Force Base, Ohio. He was the Associate Administrator for Space Transportation Systems at NASA (1981–1984). Abrahamson is currently Director of the Strategic Defense Initiative Organization.

Michael James Adams, *MOL, X-15;* Major, USAF: born May 5, 1930, Sacramento, California; died November 15, 1967, near Edwards Air Force Base, California, in an X-15 crash; was married, three children.

Received bachelor of science degree in aeronautical engineering from Oklahoma University (1958) and was chosen for the MOL program in 1965 (Group I). The next year he transferred to the X-15 program, and made a total of seven flights. On his last flight, he attained an altitude of 266,000 feet, (81.1 kilometers) thus achieving the astronaut title.

Neil Alden Armstrong, *X-15, NASA*.
Biography under NASA astronauts.

Karol Joseph Bobko, *MOL, NASA.*
Biography under NASA astronauts.



Albert H. Crews, Jr., *X-20 Dyna-Soar, MOL;* Colonel, (Retired, active duty) USAF; born March 23, 1929, El Dorado, Arkansas; married, three children.

Received bachelor of science degree in chemical engineering from the University of Southern Louisiana (1950), master of science in aeronautical engineering from the Air Force Institute of Technology, and was named to pilot the X-20 Dyna-Soar in 1962. He was chosen for the MOL program in 1965 (Group I), and after its cancellation, transferred to the NASA Flight Crew Operations directorate at Johnson Space Center, Houston, Texas. Currently, Crews is a technical assistant for aircraft operations at JSC.

Robert Laurel Crippen, *MOL, NASA.*
Biography under NASA astronauts.

Albert Scott Crossfield, *X–15;* civilian; born October 2, 1921, Berkeley, California; married, six children.

Received bachelor of science degree from the University of Washington (1949), master of science in aeronautical engineering from the University of Washington (1955), and joined the X–15 program in 1958. He made 14 flights of the X–15, including the first glide flight and the first powered fight, reaching an altitude of 81,200 feet (24.8 kilometers). When the X–15 program was turned over to NASA and the Air Force in 1960, he continued at North American Aviation. Crossfield also directed research and development programs for Eastern Airlines, and currently is a staff member with the Committee on Science and Technology, U.S. House of Representatives. His book, *Always Another Dawn,* is about his experiences as a test pilot and the X–15 program.

William Harvey Dana, *X-15;* civilian; born November 3, 1930, Pasadena, California; married, four children.

Received bachelor of science degree from the U.S. Military Academy (1952), master of science in aeronautical engineering from the University of Southern California (1958), was an Air Force pilot, and joined the X-15 program in 1965. He made 16 flights of the X-15, reaching an altitude of 310,000 feet, thus qualifying for the astronaut title. He is an aerospace research pilot at NASA's Dryden Flight Research Center, Edwards, California, currently assigned as project pilot on the Advanced Fighter Technology Integration/F-16 program and the F-15 program.

Joe Henry Engle, *X-15, NASA*.
Biography under NASA astronauts.

John Lawrence Finley, *MOL;* Captain, USN (Retired); born December 22, 1935, Winchester, Massachusetts; single, two children.

Received bachelor of science degree from the U.S. Naval Academy (1957) and was chosen for the MOL program in 1965 (Group I). He was reassigned, at his own request, to operational flying duty with the Navy before the end of the MOL program. He retired from the Navy in May 1980. Currently he is working in flight operations at the Federal Express Corp.

Charles Gordon Fullerton, *MOL, NASA.*
Biography under NASA astronauts.

Henry C. Gordon, *X-20, Dyna-Soar;* Colonel, USAF (Retired); born December 23, 1925, Valparaiso, Indiana; married, four children. Received bachelor of science degree in aeronautical engineering from Purdue University (1950) and was chosen to pilot the X-20 Dyna-Soar while assigned to the Air Force Flight Test Center at Edwards, California. When the program was cancelled, he remained on active duty with the Air Force, and is now retired.

Henry Warren Hartsfield, Jr., *MOL, NASA*.
Biography under NASA astronauts.

Robert Tralles Herres, *MOL;* General, USAF; born December 1, 1932, Denver, Colorado; married, three children.

Received bachelor of science degree from the U.S. Naval Academy (1953), master of science in electrical engineering from the Air Force Institute of Technology, master of science in public administration from George Washington University, and was chosen for the MOL program in 1967 (Group III). After cancellation of the program, he returned to flight duty with the Air Force, and was Commander, Air Force Communications Command. He is currently the Director of Command, Control, and Communications Systems in the Office of the Joint Chiefs of Staff. Until 1984, when he was appointed to his current position, Commander of CINC NORAD and space command.

William "Pete" J. Knight, *X-20 Dyna-Soar, X-15;* Colonel, USAF; born November 18, 1929, Noblesville, Indiana; married, two children.

Received bachelor of science in aeronautical engineering from the Air Force Institute of Technology (1958), and was chosen for the X-20 Dyna-Soar program in 1962. When the program was cancelled, he remained an experimental test pilot at Edwards Air Force Base, California. Colonel Knight was assigned to the X-15 program in 1964 and made a total of 16 flights, reaching an altitude of 280,500 feet (85.5 kilometers), thereby achieving the astronaut title. He also recorded the fastest speed during the X-15 program: mach 6.70 (4520 miles per hour or 7,270 kilometers per hour) on October 3, 1967. Col. Knight was Vice Commander, Air Force Test Center, Edwards AFB, California until retirement in 1982. He is currently a city councilman in Palmdale, California.

Robert Henry Lawrence, Jr., *MOL;* Major, USAF; born October 2, 1935, Chicago, Illinois; died December 8, 1967, in the crash of an F-104 at Edwards Air Force Base, California; was married, one child.

Received bachelor of science degree in chemistry from Bradley University (1956), doctorate in nuclear chemistry from Ohio State University (1965), and was chosen for the MOL program in 1967 (Group III).

U.S.
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LAWYER

Richard E. Lawyer, *MOL;* Colonel, USAF (Retired); born November 8, 1932, Los Angeles, California; married, three children.

Received bachelor of science degree in aeronautical engineering from the University of California (1955) and was chosen for the MOL program in 1965 (Group I). After MOL was cancelled, he returned to USAF flight duty to include combat. At time of his retirement he was the Deputy Commander, Operations, Tactical Air War Center, Eglin AFB, Florida.

Lachlan Macleay, *MOL;* Colonel, USAF (Retired); born June 13, 1931, St. Louis, Missouri; married, three children.

Received bachelor of science degree from the U.S. Naval Academy (1954) and was chosen for the MOL program in 1965 (Group I). After the program was cancelled, he returned to flight duty. Colonel Macleay retired from the Air Force on May 1, 1978.

John B. McKay, *X-15;* civilian; born December 8, 1922, Portsmouth, Virginia; died April 27, 1975, of complications from injuries suffered in a 1962 X-15 crash, Lancaster, California; was married, eight children.

Flew as a Navy pilot in World War II, received bachelor of science degree from Virginia Polytechnic Institute (1950) and became a test pilot and aeronautical research engineer at the NASA Flight Research Center, Edwards, California, specializing in high-speed flight research. He joined the X-15 program in 1960 and made 29 flights of the aircraft, reaching an altitude of 295,600 feet (90.1 kilometers), thus qualifying for the astronaut title.

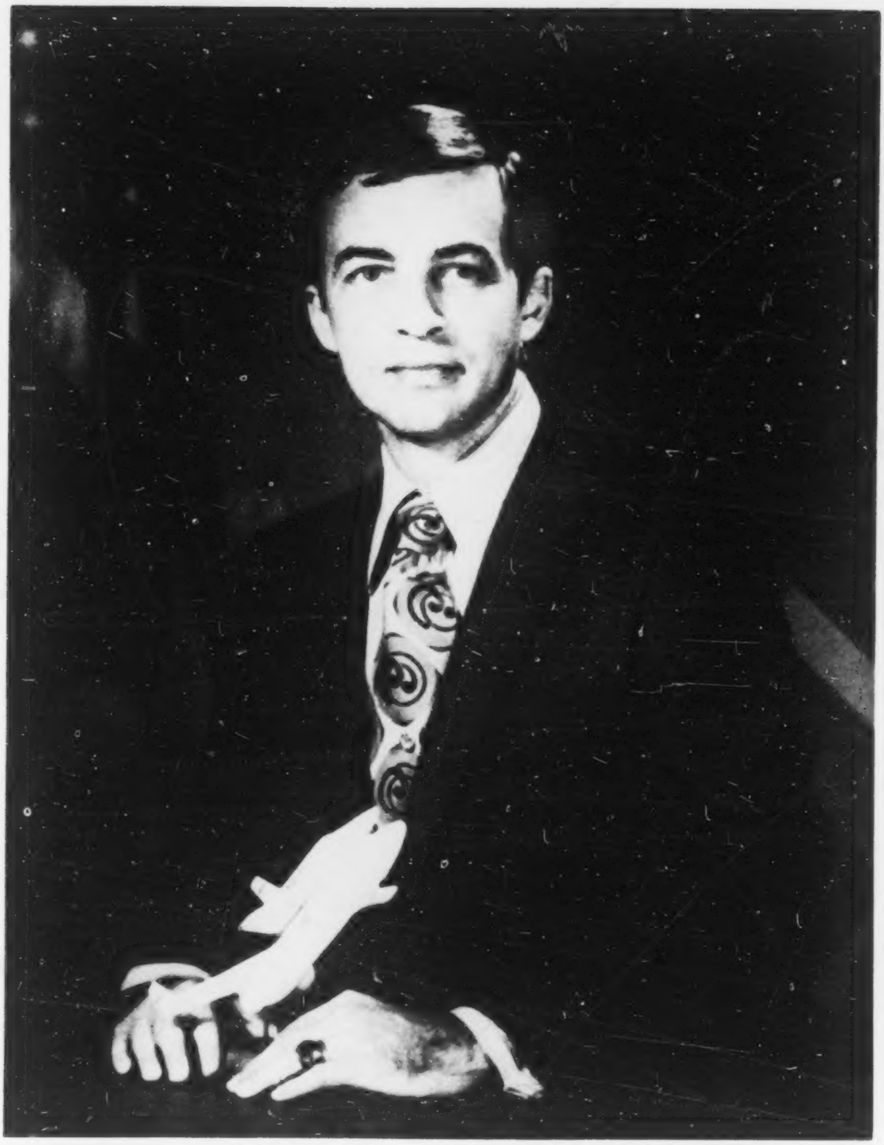
Francis Gregory Neubeck, *MOL;* Colonel, USAF (Retired); born April 11, 1932, Washington, D.C.; married, one child.

Received bachelor of science degree from the U.S. Naval Academy (1955) and was chosen for the MOL program in 1965 (Group I). When MOL was cancelled he returned to flight duty with the Air Force. He was Vice Commander, Tactical Air War Center, Eglin AFB, Florida, until his retirement. He is currently a technical consulting engineer in Florida.

Robert Franklyn Overmyer, *MOL, NASA*.
Biography under NASA astronauts.

Forrest Silas Petersen, *X-15;* Vice Admiral, USN (Retired); born May 16, 1922, Holdrege, Nebraska; married, three children.

Received bachelor of science degree from the U.S. Naval Academy (1944), bachelor of science in aerospace engineering from the U.S. Naval Postgraduate School (1952), master of science in engineering from Princeton University (1953), and joined the X-15 program in 1958. He made five flights of the X-15, reaching an altitude of 101,800 feet (31 kilometers). Since leaving the X-15 program in 1962, he has been Vice Chief of Naval Material; Deputy Chief of Naval Operations for Air Warfare; and Commander, Naval Air Systems Command, Department of the Navy, Washington, D.C. He retired from the Navy in May 1980.



Donald Herod Peterson, *MOL, NASA.*
Biography under NASA astronauts.

Russell L. Rogers, *X-20 Dyna-Soar;* Major, USAF; born April 12, 1928, Lawrence, Kansas; died September 13, 1967, in an F-105 explosion near Kadena Air Force Base, Okinawa; was married, four children.

Received bachelor of science degree in aeronautical engineering from the University of Colorado (1958) and was an experimental flight test pilot for the Air Force Test Center when chosen to pilot the X-20 Dyna-Soar. After the program was cancelled, he returned to active flight duty with the Air Force.

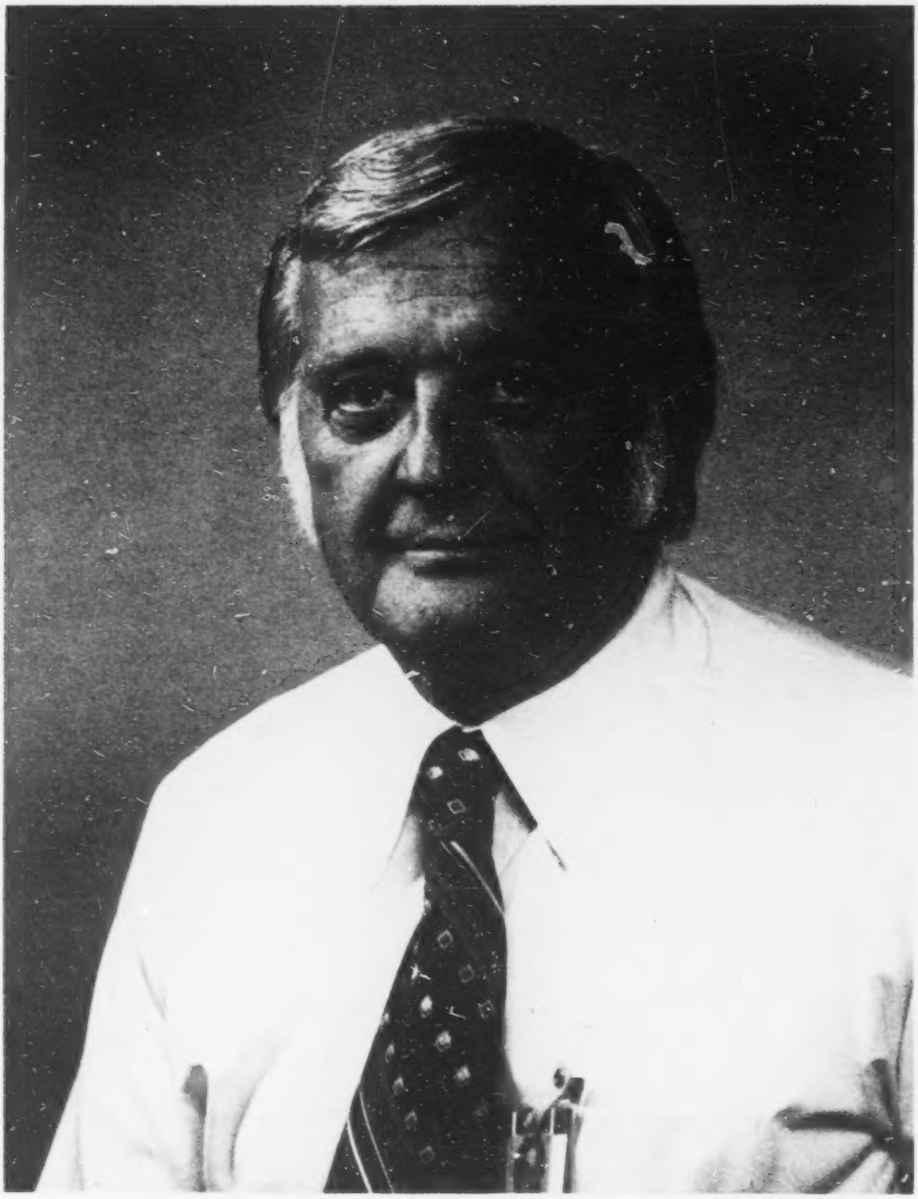
U.S.
RUSHWORTH

Robert A. Rushworth, *X-15;* Major General, USAF (Retired); born October 9, 1924, Madison, Maine; married, one child.

Received mechanical engineering degree from the University of Maine (1951), bachelor of science in aeronautical engineering from the Air Force Institute of Technology (1954), and was selected as an X-5 pilot in 1958. He made the greatest number of X-15 flights (34), reaching an altitude of 285,000 feet (86.9 kilometers), thus achieving the astronaut title. General Rushworth left the X-15 program in 1966 and since that time has been Commander of the Air Force Flight Test Center at Edwards Air Force Base: Commander for the Air Force Test and Evaluation Center at Kirtland Air Force Base; and was Vice Commander, Aeronautical Systems Division, Air Force Systems Command, Wright Patterson Air Force Base, Ohio, until his retirement.

James M. Taylor, *MOL;* Lieutenant Colonel, USAF; born November 27, 1930, Stamps, Arkansas; died September 4, 1970 in the crash of a T-38 jet near Palmdale, California; was married, three children.

Received Associate of Arts degree at Southern State University (1950), bachelor of science in electrical engineering at the University of Michigan (1959), an was chosen for the MOL program in 1965 (Group I). He returned to flight duty with the Air Force when MOL was cancelled, and was an instructor at the Test Pilot School, Edwards Air Force Base, California, at the time of his death.



Milton O. Thompson, *X-20 Dyna-Soar, X-15;* civilian; born May 4, 1926, Crookston, Minnesota; married, five children.

Flew as a Navy pilot during World War II, received bachelor of science degree in engineering from the University of Washington (1953), and was the only civilian chosen to fly the X-20 Dyna-Soar. With that program's cancellation, he was assigned to the X-15, and made 14 flights from 1963 to 1965 reaching an altitude of 214,000 feet (65.3 kilometers). He was the first person to fly a lifting body (wingless craft which obtains lift from its shape) in August 1963. In the fall of 1966, Mr. Thompson became the Director of Research Projects, NASA Dryden Flight Reseach Center, Edwards, California, and is currently Chief Engineer of NASA's Ames-Dryden Flight Research Facility.

Richard Harrison Truly, *MOL, NASA.*
Biography under NASA astronauts

Joseph Albert Walker, *X-15;* civilian; born February 20, 1921, Washington, Pennsylvania; died June 8, 1966, in a mid-air collision between the F-104 he was piloting and an XB-70; was married, four children.

Received bachelor of arts degree in physics from Washington and Jefferson College (1942), became an Air Force pilot during World War II, and flew the X-15 from 1960 to 1963. He made the first X-15 research flight on March 25, 1960, and subsequently made 24 more X-15 flights, reaching the highest altitude attained during the program (354,200 feet, or 108 kilometers), thereby qualifying for the astronaut title.

Robert Michael White, *X-15;* Major General, USAF (retired); born July 6, 1924, New York, New York; married, four children.

Received bachelor of electrical engineering from New York University (1951), master of business administration from George Washington University (1966), and flew the X-15 from 1960 to 1962. He made 16 flights of the X-15 reaching an altitude of 314,750 feet (95.9 kilometers) and becoming the first astronaut so designated in a winged aircraft. He returned to the Air Force and was Chief of Staff, 4th Allied Tactical Air Force, Europe. He retired from the Air Force February 1, 1981, and currently resides in Heidelberg, West Germany.

James W. Wood, *X-20 Dyna-Soar;* Colonel, USAF (Retired); born August 9, 1924, Paragould, Arkansas; married, three children.

Received bachelor of science degree in aeronautical engineering from the Air Force Institute of Technology (1956) and was an experimental flight test pilot at the Air Force Flight Test Center when named to pilot the X-20 Dyna-Soar. After the program was cancelled, he remained on active duty with the Air Force. Colonel Wood was Commander, Test Operations, Edwards Air Force Base, California, and is currently retired.

CHAPTER FOUR

SOVIET COSMONAUTS

Information on cosmonauts from the Soviet Union is not as readily available as it is for their American counterparts. Ordinarily, cosmonauts become known only when they make a flight. The only exceptions to this rule occurred with the Apollo-Soyuz Test Project in 1975 when five cosmonauts who were either back-up or support crew for the mission were identified (Andreyev, Dzhanibekov, Illarionov, Ivanchenkov and Romanenko), and with crews that include cosmonauts from countries other than the Soviet Union (backups are usually named).

The biographical information used in this report is not as complete for the Soviet cosmonauts as it is for the Americans. While the data provided here are the latest and most complete available, there is uncertainty as to whether it is current. For example, some of the cosmonauts may have been promoted in rank, completed graduate studies, or added to their families without further public announcement.

Preceding sections on American astronauts show that they joined their respective programs in distinct groups. It is probable that the same situation is true in the Soviet Union, although the members of each group usually become known only after they have made a space flight. Table 4-1 shows the years that the cosmonauts were chosen according to reports in the Soviet press. The true size of each group, however, can only be surmised since, for example, one member of the 1963 selection group (Zholobov) did not make his first flight until 1976 and was unknown prior to that time. Also, there may be cosmonauts who were killed in training or left the program for other reasons, just as in the U.S. corps. Concurrently, it is difficult to assess the flight status of cosmonauts since such announcements are rarely made. The "status" column in table 4-1 therefore, represents a "best guess" situation. The table includes Soviet-bloc "Intercosmonauts" who are further discussed in chapter 5.

TABLE 4-1a

STATUS OF SOVIET COSMONAUTS BY GROUP

Name	Year of First Flight	Status
	1960 Pilot Selection a/	
Bel'yayev	1965	Deceased (following surgery)
Bykovsky	1963	Active
Gagarin	1961	Deceased (jet crash)
Gorbatko	1969	Active
Khrunov	1969	Inactive
Komarov	1964	Deceased (Soyuz 1)
Leonov	1965	Inactive
Nikolayev	1962	Inactive
Popovich	1962	Inactive
Shonin	1969	Inactive
Titov	1961	Resigned
Volynov	1969	Active
	1962 Selection	
Tereshkova	1963	Resigned
	1963 Pilot Selection	
Dobrovolsky	1971	Deceased (Soyuz 11)
Filipchenko	1969	Inactive
Gubarev	1975	Inactive
Shatalov	1969	Inactive
	1963 Military Engineer Selection	
Artyukhin	1974	Inactive
Demin	1974	Inactive
Zholobov	1976	Inactive
	1964 Pilot Selection	
Beregovoi	1968	Inactive
	1964 Scientist Selection	
Feoktistev	1964	Resigned
Lazarev b/	1973	Reselected in 1966
Yegorov	1964	Resigned
	1965 Pilot Selection	
Kizim	1980	Active
Klimuk	1973	Inactive
Sarafanov	1974	Inactive
Zudov	1976	Inactive
	1965 Military Engineer Selection	
Glazkov	1977	Active
Rozhdestvenski	1976	Active

TABLE 4-1a (cont.)

Name	Year of First Flight	Status
	1966 Pilot Selection	
Grechko	1975	Active
Lazarev b/	1973	Inactive
	1966 Civil Engineer Selection c/	
Kubachev	1969	Inactive
Makarov	1973	Inactive
Volkov	1969	Deceased (Soyuz 11)
Yeliseyev	1969	Inactive
	1967 Pilot Selection	
Lyakhov	1979	Active
Kovalenok	1977	Active
Malyshev	1980	Active
	1967 Civil Engineer Selection	
Rukavishnikov	1971	Inactive
Sevast'yanov	1970	Inactive
	1969 Civil Engineer Selection	
Patsayev	1971	Deceased (Soyuz 11)
	1970 Pilot Selection	
Berezovoi	1982	Active
Dzhanibekov	1978	Active
Illarionov	pending	Active
Popov	1980	Active
Romanenko	1977	Active
	1970 Civil Engineer Selection	
Andreyev	none	Inactive
Ivanchenko	1978	Active
	1972 Civil Engineer Selection	
Lebedeyev	1973	Active
	1973 Civil Engineer Selection	
Aksyonov	1976	Inactive
Ryumin	1977	Inactive
Strekalov	1980	Active
	1976 Pilot Selection	
Titov, V.	1983	Active
	1977 Scientist Selection	
Atkov	1984	Active

TABLE 3-1

SUMMARY OF X-15, X-20, AND MOL ASTRONAUTS

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Program	Comments
Abrahamson	III/1967	USAF/Lt. Gen.	California	MOL	Director, Strategic Defense Initiative Organization.
Adams	I/1965 1966	USAF/Maj.	California	MOL X-15	Killed in the crash of the X-15 in which he reached an altitude of 266,000 feet (81.1 kilometers), thus achieving the astronaut rating. Completed 7 X-15 flights in all.
Armstrong	1958*	Civilian	Ohio	X-15	Completed a total of 7 X-15 flights (attaining an altitude of 207,500 feet) and then transferred to the NASA astronaut group (see table 1-5).
Bobko	II/1966	USAF/Lt.Col.	New York	MOL	Transferred to the NASA astronaut group (see table 1-5).
Crews	1962 I/1965	USAF/(Col.)	Arkansas	X-20 MOL	Technical Assistant for Aircraft Operations, Johnson Space Center.
Crippen	II/1966	USN/Capt.	Texas	MOL	Transferred to NASA astronaut group (see table 1-5).
Crossfield	1958	Civilian	California	X-15	Completed 14 X-15 flights, including the first glide flight and first powered flight (attained an altitude of 81,200 feet, 24.8 kilometers). Currently a staff member of the Committee on Science and Technology, U.S. House of Representatives.

TABLE 3-1 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Program	Comments
Dana	1965	Civilian	California	X-15	Completed 16 X-15 flights, attaining an altitude of 306,000 feet (93.3 kilometers), thus achieving the astronaut rating. Currently a research pilot at NASA's Dryden Flight Research Center.
Engle	1963	USAF/Col.	Kansas	X-15	Completed 16 X-15 flights, attaining an altitude of 280,600 feet, thus achieving the astronaut rating. Transferred to NASA astronaut group (see table 1-5).
Finley	I/1965	USN/(Capt.)	Texas	MOL	Flight Operations, Federal Express Corp.
Fullerton	II/1966	USAF/Col.	New York	MOL	Transferred to NASA astronaut group (see table 1-5).
Gordon	1962	USAF/(Col.)	Indiana	X-20	Now retired.
Hartsfield	II/1966	USAF/(Col.)	Alabama	MOL	Transferred to NASA astronaut group (see table 1-5).
Herres	III/1967	USAF/Gen.	Colorado	MOL	Commander, CINC NORAD and Space Command.
Knight	1962 1964	USAF/Col.	Indiana	X-20 X-15	Completed 16 X-15 flights, attaining an altitude of 280,500 feet (85.5 kilometers), thus achieving the astronaut rating. Also attained highest speed (4520 mph, 7,270 kilometers per hour). Now retired.
Lawrence	III/1967	USAF/Maj.	Illinois	MOL	Killed in an F-104 crash in December 1967.
Lawyer	I/1965	USAF/(Col.)	California	MOL	Now retired.

TABLE 3-1 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Program	Comments
Macleay	I/1965	USAF/(Col.)	Missouri	MOL	Now retired.
McKay	1960	Civilian	Virginia	X-15	Completed 29 flights of the X-15, attaining an altitude of 295,600 feet (90.1 kilometers), thus achieving the astronaut rating. Died on April 27, 1975, from injuries suffered in a 1962 X-15 crash.
Neubeck	I/1965	USAF/(Col.)	Washington, DC	MOL	Consulting technical engineer, Florida.
Overmyer	II/1966	USMC/Col.	Ohio	MOL	Transferred to NASA astronaut group (see table 1-5).
Petersen	1958	USN/(Vice Adm.)	Nebraska	X-15	Now retired.
Peterson	III/1967	USAF/(Col.)	Mississippi	MOL	Transferred to NASA astronaut group (see table 1-5).
Rogers	1962	USAF/Maj.	Kansas	X-20	Killed in an F-105 explosion in September 1967, after leaving the X-20 program.
Rushworth	1958	USAF/(Maj.Gen.)	Maine	X-15	Completed the largest number of X-15 flights, 34, reaching an altitude of 285,000 feet (86.9 kilometers), thus achieving the astronaut rating. Now retired.
Taylor	I/1965	USAF/Lt.Col.	Arkansas	MOL	Killed in a T-38 crash in September 1970, after leaving the MOL program.
Thompson	1962 1963	Civilian	Minnesota	X-20 X-15	Completed 14 X-15 flights (reaching an altitude of 214,100 feet (65.3 kilometers)). Currently Chief Engineer, NASA Dryden Flight Research Center.

TABLE 3-1 (cont.)

Name	Group/Year Chosen	Service/Rank (Retired)	Native State	Program	Comments
Truly	I/1965	USN/Commodore	Mississippi	MOL	Transferred to NASA astronaut group (see table 1-5).
Walker	1958*	Civilian	Pennsylvania	X-15	Completed 25 X-15 flights, reaching the highest altitude during that program (354,200 feet or 108 kilometers), thus achieving the astronaut rating. Died in a mid-air collision in June 1966.
White	1958*	USAF/(Maj.Gen.)	New York	X-15	Completed 16 flights in the X-15, attaining an altitude of 314,750 feet (95.9 kilometers), thus achieving the astronaut rating. Now retired.
Wood	1962	USAF/(Col.)	Arkansas	X-20	Director, Flight Operations, Flight Systems Inc., Newport Beach, California.

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* No specific record of when these three men entered the X-15 program could be found. An examination of the flight record suggests the dates given here as the most likely years of selection.

TABLE 3-2. SUMMARY TABLE OF U.S. ASTRONAUT PROGRAM

Group/year chosen	Number named	Have flown missions	Died while in program	Withdrew from program	Transferred to other programs	Left due to cancellation	Remaining in program
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ASTRONAUTS							
I -- 1959	7	7	1	6	0	0	0
II -- 1962	9	8	2	6	0	0	1
III -- 1963	14	10	4	10	0	0	0
IV -- 1965	6	4	0	4	0	0	2
V -- 1966	19	17	1	12	0	0	5
VI -- 1967	11	5	0	5	0	0	6
VII -- 1969	7	7	0	2	0	0	5
VIII -- 1978	35	33	0	1	0	0	34
IX -- 1980	19	0	0	0	0	0	19
X -- 1984	17	0	0	0	0	0	17
Subtotal	144	91	8	46	0	0	89
X-15 ASTRONAUTS							
Various	12	8	2	0	2 a/	8	0
X-20 DYNA-SOAR ASTRONAUTS							
I -- 1962	6	0	0	0	2 b/ 1 c/	3	0
MANNED ORBITING LABORATORY (MOL) ASTRONAUTS							
I -- 1965	8	0	0	0	1 b/ 1 a/	6	0
II -- 1966	5	0	0	0	5 a/	0	0
III -- 1967	4	0	1	0	1	2	0
Subtotal	17	0	1	0	8	8	0
Totals	179 d/	99	11	41	13	19	89

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a/ To NASA.
b/ To X-15.
c/ To MOL.
d/ Reflects only 165 different individuals, 14 of whom were named to more than one program.

TABLE 4-1a (cont.)

Name	Year of First Flight	Status
	1978 Civil Engineer Selection	
Aleksandrov	1983	Active
Savinykh	1981	Active
Serebrov	1982	Active
Solovyov	1984	Active
Volk	1984	Active
	1980 Pilot Selection	
Savitskaya	1982	Active

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a/ In 1960, 20 men were selected, although only 12 of them flew. The first names only of the remaining 8 were available in the literature: Grigori, Mars, Valentin, Valentin, Anatoli, Dmitri, Ivan, and Valentin.

b/ Lazarev was originally selected in 1963, and was backup for Yegerov (Voskhod 1). However, he was then stood down and reselected in 1966.

c/ Col. Sergei N. Anokhin was selected in 1966 but was stood down due to poor health.

TABLE 4-1b

INTERKOSMOS AND INTERNATIONAL PARTICIPANTS IN SOVIET PROGRAM

Name	Year of First Flight	Country	Status
First Interkosmos Selection -- 1976			
Hermaszewski	1978	Poland	Resigned, in Polish Air Force
Jahn	1978	DDR	Resigned, in DDR AF
Jankowski	none	Poland	Resigned, in Polish AF
Kollner	none	DDR	Resigned, in DDR AF
Pelcak	none	Czechoslovakia	Resigned, in Czech AF
Remek	1978	Czechoslovakia	Resigned, in Czech AF
Second Interkosmos Selection -- 1978			
Alexandrov	none	Bulgaria	Resigned, in Bulgarian AF
Dediu	none	Rumania	Resigned, in Rumanian AF
Farkas	1980	Hungary	Resigned, in Hungarian AF
Ganzorig	none	Mongolia	Resigned, in Mongolian AF
Gurragcha	1981	Mongolia	Resigned, in Mongolian AF
Ivanov	1979	Bulgaria	Resigned, in Bulgarian AF
Lopez-Falcon	none	Cuba	Resigned, in Cuban AF
Magyari	none	Hungary	Resigned, in Hungarian AF
Prunariu	1981	Rumania	Resigned, in Rumanian AF
Tamayo-Mendez	1980	Cuba	Resigned, in Cuban AF
Third Interkosmos Selection -- 1979			
Bui Thanh Liem	none	Vietnam	Deceased (jet crash)
Pham Tuan	1980	Vietnam	Resigned, in Vietnamese AF
First International Selection -- 1979			
Baudry	pending	France	working at CNES, flew on U.S. shuttle
Chretien	1982	France	working at CNES
Second International Selection -- 1982			
Malhotra	none	India	Resigned, in Indian AF
Sharma	1984	India	Resigned, in Indian AF

The 68 cosmonauts (including Soviet, Interkosmos, and International) who have made space flights have accumulated 88,317 hours and 15 minutes of time in space, including 80 hours and 14 minutes of extravehicular activity. Table 4-2 provides a breakdown of time in space for each cosmonaut.

TABLE 4-2

COSMONAUT CUMULATIVE SPACE AND EVA TIMES*

Cosmonaut	Number of Flights	Total Time in Space (hrs:mins)	EVA** (hrs:mins)
Aksenov	2	284:15	none
Alekandrov	1	3585:46	5:45
Artyukhin	1	377:30	none
Atkov	1	5686:50	none
Belyayev	1	26:02	none
Beregovoi	1	94:51	none
Berezovoi	1	5073:05	2:33
Bykovskiy	3	497:49	none
Chretien	1	189:51	none
Demin	1	48:12	none
Dobrovolsky	1	570:22	none
Dzhanibekov	4	802:47	3:35
Farkas	1	188:46	none
Feoktistov	1	24:17	none
Filipchenko	2	261:05	none
Gagarin	1	1:48	none
Glazkov	1	425:23	none
Gorbatko	3	732:46	none
Grechko	2	3023:20	1:28
Gubarev	2	899:37	none
Gurragcha	1	186:43	none
Hermaszewski	1	190:04	none
Ivanchenkov	2	3540:39	2:05
Ivanov	1	47:01	none
Jahn	1	188:49	none
Khrunov	1	47:49	1:00
Kizim	2	5993:58	22:50
Klimuk	3	1890:19	none
Komarov	2	50:54	none
Kovalenok	3	5194:12	2:05
Kubasov	3	449:59	none
Lazarev	2	47:36	none
Lebedev	2	5262:00	2:33
Leonov	2	168:33	0:24
Lyakhov	2	7786:22	7:08
Makarov	4	497:43	none
Malyshev	2	284:02	none
Nikolayev	2	519:24	none
Patsayev	1	570:22	none
Pham Tuan	1	188:42	none
Popov	3	4814:45	none
Popovich	2	448:29	none
Prunariu	1	188:41	none
Remek	1	190:17	none

TABLE 4-2 (cont.)

Cosmonaut	Number of Flights	Total Time in Space (hrs:mins)	EVA** (hrs:mins)
Romanenko	2	2502:43	none
Rozhdestvenski	1	48:06	none
Rukavishnikov	3	237:11	none
Ryumin	3	8685:34	1:23
Sarafanov	1	48:12	none
Savinykh	1	1794:38	none
Savitskaya	2	473:06	3:35
Serebrov	2	238:10	none
Sevest'yanov	2	1936:19	none
Sharma	1	189:41	none
Shatalov	3	237:59	none
Solovyov	1	5686:50	22:50
Shonin	1	118:42	none
Strekalov	2	355:26	none
Tamayo-Mendez	1	188:43	none
Tereshkova	1	70:50	none
Titov, V.	3	263:17	none
Volk	1	283:14	none
Volkov	2	689:03	none
Volynov	2	1255:20	none
Yegorov	1	24:17	none
Yeliseyev	3	214:25	1:00
Zholobov	1	1182:24	none
Zudov	1	48:06	none
TOTAL 68 cosmonauts	57 flights	88,317:58	80:14

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* Includes all persons launched by the Soviet Union regardless of nationality.

** The length of time cosmonauts spent on EVA (extravehicular activity) has never been officially announced by the Soviet Union for Voskhod 2 or Soyuz 4/5, and different calculations have been made for the EVAs which occurred on these flights. The data presented here are roughly equivalent to the "hatch opening to hatch closing"times used in the U.S. Gemini program, as near as can be determined. It has been stated in the literature that Leonov actually spent 12 minutes completely outside the spacecraft on Voskhod 2, and that Khrunov and Yeliseyev spent an actual 15 minutes transferring from Soyuz 5 to Soyuz 4. On Soyuz 26, the Russians announced that Grechko and Romaneko spent one hour and twenty eight minutes in the "near vacuum conditions of space" which is taken here to mean hatch opening to hatch closing, although only Grechko performed EVA. According to the Soviet press, he spent 20 minutes outside the spacecraft.

The Soviet Union announced on December 24, 1976 (TASS, 1412 GMT) that persons from other Interkosmos countries would be trained as cosmonauts and that the first group, representing Czechoslovakia, Poland and the German Democratic Republic, were already in training at Zvezdniy Gorodok (Star City). In March 1978, the first "Interkosmonaut," Vladimir Remek of Czechoslovakia, flew into space aboard Soyuz 28. By the end of March 1983, nine more Interkosmonauts had made space flights as follows: Hermaszewski of Poland (Soyuz 30), Jahn of East Germany (Soyuz 31), Ivanov of Bulgaria (Soyuz 33), Farkas of Hungary (Soyuz 36), Pham Tuan of Vietnam (Soyuz 37), Tamayo-Mendez of Cuba (Soyuz 38), Gurragcha of Mongolia (Soyuz 39), Prunariu of Romania (Soyuz 40), and Chretien of France (Soyuz T-6). Most recently, Sharma of India flew on Soyuz T-11/Salyut 7.

Regarding speculation about secret deaths of Soviet cosmonauts in actual space flight during the early years of the Soviet space program, it seems unlikely that any cosmonauts other than the four identified in this report (Dobrovolsky, Komarov, Patsayev and Volkov) have been killed in space. Soviet manned flights require positioning of support ships worldwide, and any suggestion that undetected manned flights have been made would have to include the supposition that no support ships were assigned to provide communication links with the crew. This, and the lack of any other evidence about such secret flights, suggests that these stories are speculation and rumor only, with no basis in fact.

A. BIOGRAPHIES OF SOVIET-BLOC COSMONAUTS

Vladimir Viktorovich Aksenov; civilian; born February 1, 1935, Gibilitskiy Village, Ryazan Region; married, two children.

Graduated from an Air Force Officer's School (1957), worked as a design engineer with Sergei Korolev, graduated from the All-Union Polytechnical Institute with an engineering degree (1963), worked on space flight design, including hyperbolic simulation flights (during which he logged nine hours in weightlessness), and joined the cosmonaut corps in 1973. He was the flight engineer for Soyuz 22, and for Soyuz T-2/Salyut 6.

NO PHOTOGRAPH AVAILABLE

Aleksandr Pavlovich Aleksandrov; civilian; born February 20, 1943, Moscow.

Served in the Soviet Army until 1964 when he began work in a design bureau. He graduated from night school at Bauman Higher Technical School in Moscow in 1969. Aleksandrov has worked in the development of spacecraft control systems under the direction of USSR Academy of Sciences member B. Raushenbakh. He joined the cosmonaut corps in 1978 and served as back-up crew for Soyuz T-8 and then flew as a flight engineer on Soyuz T-10/Salyut 7.

Boris Dmitriyevich Andreyev; civilian, born October 6, 1940, Moscow; married, two children.

Graduated from Bauman Higher Technical School in Moscow, joined a design bureau in 1965, and joined the cosmonaut corps in 1970. He was a member of the second backup crew for the Apollo-Soyuz Test Project.

Yurity Petrovich Artyukhin; Colonel Engineer, Soviet Air Force; born July 22, 1930, Pershutino, near Moscow; married, two children.

Attended Serpukhov Air Force Technical School, served in the Air Force for several years, graduated from Zhukovskiy Air Force Engineering Academy (1958), and joined the cosmonaut corps in 1963. He was the flight engineer on Soyuz 14/ Salyut 3.

NO PHOTOGRAPH AVAILABLE

Oleg Yur'yevich Atkov; civilian; born May 9, 1949, Khvorostyanka, Khvorostyanka Region, Kubyshev Oblast.

Graduated from Sechenov Medical Institute in Moscow in 1973 and continued training at the All-Union Cardiology Research Center, where he consulted with the Cosmonaut Training Center. At the Myasnikov Institute of Cardiology, he served as head of the group on ultrasonic methods for the study of heart disease. Atkov was selected for the cosmonaut corps in 1977, and flew on Soyuz T-10/Salyut 7, as cosmonaut-researcher, setting a new record for consecutive days in orbit.

Pavel Ivanovich Belyayev; Colonel, Soviet Air Force; born June 26, 1925, Chelishchevo, Vologda region; died January 10, 1970, from complications following an operation for stomach ulcers; was married, two children.

Attended the Red Banner Air Force Academy, and joined the cosmonaut corps in 1960. He was the command pilot of Voskhod 2.

Georgi Timofeyevich Beregovoi; Lieutenant General, Soviet Air Force; born April 15, 1921, Fedorovka, the Ukraine; married, two children.

Attended Lugansk Military Aviation School, graduated from the Red Banner Air Force Academy (1956), and joined the cosmonaut corps in 1964. He graduated from the Gagarin Air Force Academy in 1977. He was the pilot of Soyuz 3 and is currently Director of the Gagarin Center for Cosmonaut Training.

NO PHOTOGRAPH AVAILABLE

Anatoliy Nikolayevich Berezovoi; Colonel, Soviet Air Force; born April 11, 1942, Enem; married, two children.

Graduated from flight school in 1965. He joined the cosmonaut corps in 1970 and was flight commander for Soyuz T-5/Soyuz T-7/Salyut 7, spending a record 211 days in space.

Valeriy Fedorovich Bykovsky; Colonel, Soviet Air Force; born August 2, 1934, Pavolo-Posad, near Moscow; married, two children.

Joined the cosmonaut corps in 1960, and graduated from the Zhukovskiy Air Force Engineering Academy (1968). He was the backup pilot for Vostok 3, pilot of Vostok 5, was chief of cosmonaut training for the Apollo-Soyuz mission, and was command pilot of Soyuz 22 and of the Soyuz 31/Soyuz 29/Salyut 6 mission.

Lev Stepanovich Demin; Colonel Engineer, Soviet Air Force; born January 11, 1926, Moscow; married, two children.

Graduated from an Air Force Communications School, Zhukovskiy Air Force Engineering Academy (1956), earned a degree as candidate of technical sciences (1963), and joined the cosmonaut corps in 1963. He was flight engineer on Soyuz 15/ Salyut 3.

Georgi Timofeyevich Dobrovolsky; Lieutenant Colonel, Soviet Air Force; born June 1, 1928, Odessa; died June 29, 1971, during Soyuz 11 reentry; was married, two children.

Graduated from the Chuguyev Air Force School, and joined the cosmonaut corps in 1963. He was the command pilot of Soyuz 11/Salyut 1.

Vladimir Aleksandrovich Dzhanibekov; Colonel, Soviet Air Force; born May 13, 1942, Iskander, South Kazakhstan region; married, two children.

Graduated from the Higher Aviation School as a pilot-engineer (1965) and joined the cosmonaut corps in 1970. He was a member of the second backup crew for the Apollo-Soyuz Test Project, and commander of Soyuz 27/Salyut 6 and Soyuz 39/Salyut 6, Soyuz T-6/Salyut 7, and Soyuz T-12/Salyut 7.

Konstantin Petrovich Feoktistov; civilian; born February 7, 1926, Voronezh; married, one child.

Graduated from the Bauman Higher Technical School in Moscow with a master of science degree in engineering (1949) and now holds the degree of doctor of technical sciences. He joined the cosmonaut corps in 1964 and was the technical scientist of Voskhod 1. After his space flight, Dr. Feoktistov returned to high-level engineering and played a major role in designing the Salyut space stations.

Anatoliy Vasil'yevich Filipchenko: Major General, Soviet Air Force; born February 26, 1928, Davydovka village, Voronezh region; married, two children.

Graduated from Chuguyev Air Force School, from the Red Banner Air Force Academy (1961) and joined the cosmonaut corps in 1963. He was backup command pilot for Soyuz 4, command pilot on Soyuz 7, commander of Soyuz 16, and was a member of the primary backup crew for the Apollo-Soyuz Test Project.

Yuri Alekseyevich Gagarin; Colonel, Soviet Air Force; born March 9, 1934, Gzhast district, Smolsensk region; died March 27, 1968, in the crash of a jet trainer; was married, two children.

Attended Aviation School in Orenburg, Zhukovskiy Air Force Engineering Academy, and joined the cosmonaut corps in 1960. He was the pilot of Vostok 1, becoming the first man in space, and backup pilot for Soyuz 1.

Yuri Nikolayevich Glazkov; Colonel Engineer, Soviet Air Force; born October 2, 1939, Moscow.

Graduated from the Higher Engineering College of the Air Force in Kharkhov (1962), worked as an engineer in the Soviet Air Force, is a paratroop instructor for the Air Force, and joined the cosmonaut corps in 1965. He was the backup flight engineer for Soyuz 23/Salyut 5 and flight engineer for Soyuz 24/Salyut 5. He is currently working at the Gagarin Cosmonaut Training Center.

Viktor Vasil'yevich Gorbatko; Major General, Soviet Air Force; born December 3, 1934, Kuban River region, North Caucasus; married, two children.

Entered the Bataysk Air Force School near Rostov in 1953, joined the cosmonaut corps in 1960, and graduated from the Zhukovkiy Air Force Engineering Academy (1968). He was relieved of his duties as backup for Voskhod 2 due to medical reasons, was backup pilot for Soyuz 5, research engineer for Soyuz 7, backup pilot for Soyuz 23/Salyut 5, and pilot for Soyuz 24/Salyut 5, and commander for the Soyuz 34/Soyuz 36/ Salyut 6 mission. He is currently working at the Gagarin Cosmonaut Training Center.

Georgiy Mikhailovich Grechko; civilian; born May 25, 1931, Leningrad; married, two children.

Graduated from the Leningrad Institute of Mechanics (1955), worked at a design bureau, received a master of technical sciences degree (1967) on the basis of work connected with landing automatic stations on the Moon, and joined the cosmonaut corps in 1966. He was the flight engineer for Soyuz 17/Salyut 4 and for Soyuz 26/Salyut 6.

Alesksei Aleksandrovich Gubarev; Colonel, Soviet Air Force; born March 29, 1931. Kuibyshev, on the Volga; married, two children. Graduated from the Naval Air Force School, Gagarin Air Force Academy, and joined the cosmonaut corps in 1963. He was command pilot of Soyuz 17/Salyut 4 and of Soyuz 28/Salyut 6.

Valeriy Vasil'yevich Illarionov; pilot; born July 2, 1939.

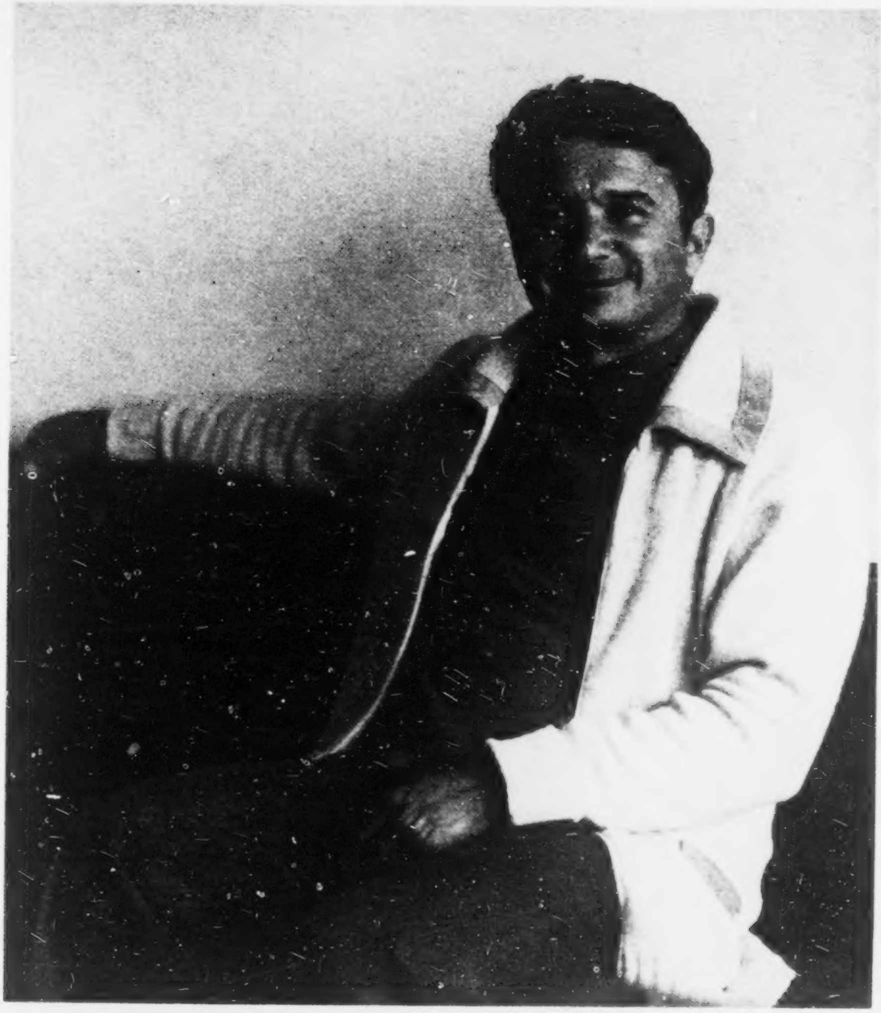
Illarionov joined the cosmonaut corps in 1970 and acted as a Houston Capcom during the Apollo-Soyuz Test Project and was identified as a cosmonaut. The Soviet Academy of Sciences later confirmed this identification, although little personal information was released.

Aleksandr Sergeyevich Ivanchenkov; civilian; born September 28, 1940, Ivanteyevka, near Moscow; married, one child.

Graduated from the Moscow Aviation Institute, joined a design bureau in 1964, and joined the cosmonaut corps in 1970. He was backup flight engineer for Soyuz 16, a member of the third backup crew for the Apollo-Soyuz Test Project, flight engineer for the Soyuz 29/Soyuz 31/Salyut 6 mission, and flight engineer for Soyuz T-6/Salyut 7.

Yevgeniy Vasil'yevich Khrunov; Colonel, Soviet Air Force; born September 10, 1933, Pruidy, near Tula; married, one child.

Graduated from Batay Military Aviation College (1956), joined the cosmonaut corps in 1960, graduated from the Zhukovskiy Air Force Engineering Academy (1968), and has since earned a master of science degree. He was the backup pilot of Voskhod 2 and the engineer pilot for both Soyuz 4 and 5, transferring from Soyuz 5 to Soyuz 4 in space during the flight. He has coauthored a book, *Man as Operator in Cosmic Flight*.



Leonid Denisovich Kizim; Colonel, Soviet Air Force; born August 5, 1941, Krasny Liman, Ukraine; married, one child.

Graduated from the Higher Aviation School at Chernigov in 1963 and entered the Air Force. He joined the cosmonaut corps in 1965 and later graduated from the Gagarin Air Force Academy. He took an active part in the testing of the ship (Soyuz T-3) on the ground. He was flight commander for Soyuz T-3/ Salyut 6, and backup commander for Soyuz T-6/ Salyut 7. He served as commander for Soyuz T-10/Salyut 7, the mission which set a new record of 237 days in space. During that mission, Kizim and Solovyov made a record six spacewalks.

Pyotr Il'yich Klimuk; Major General, Soviet Air Force; born July 10, 1942, Komarovka Village, Byelorussia; married, one child.

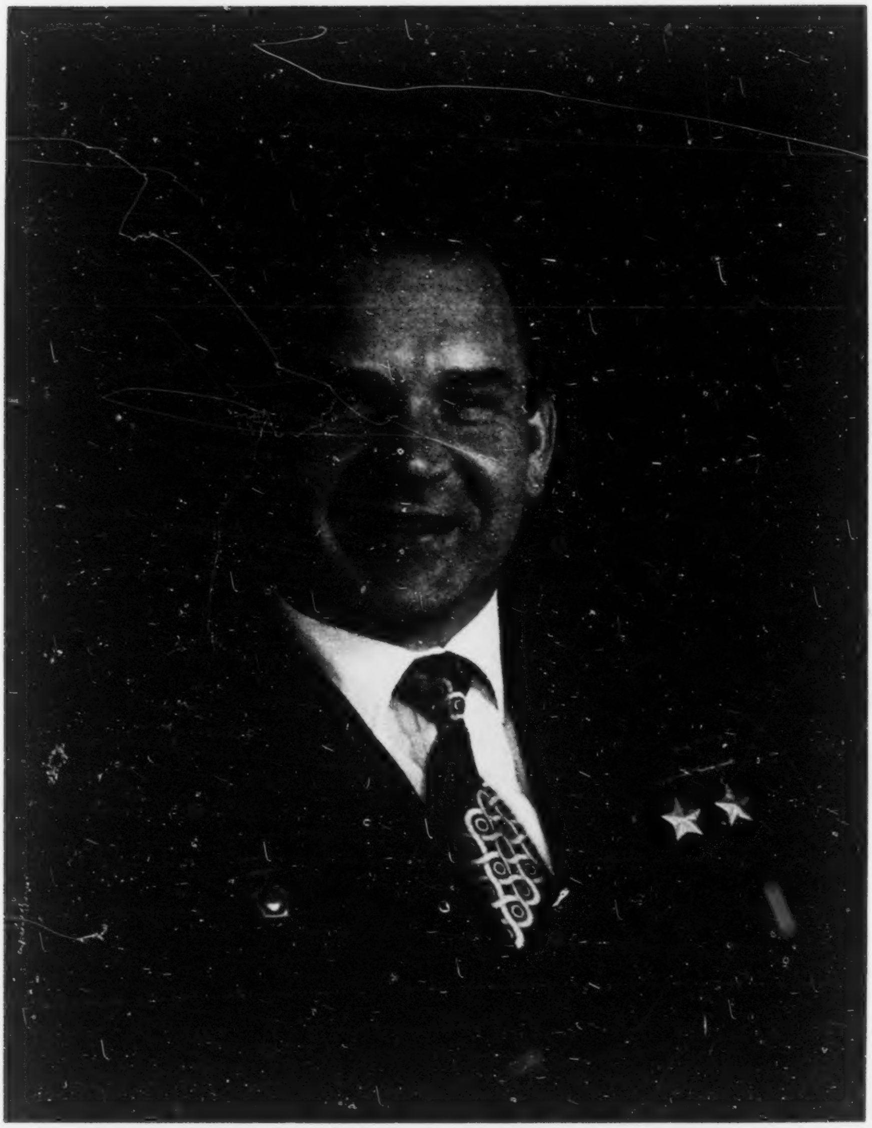
Graduated from the Air Force College in Chernigov (1964), served in the Air Force, and joined the cosmonaut corps in 1965. He was the command pilot of Soyuz 13, Soyuz 18/Salyut 4, and of Soyuz 30/ Salyut 6. Klimuk is head of the Political Department at the Gagarin Cosmonaut Training Center.

Vladimir Mikhaylovich Komarov; Engineer Colonel, Soviet Air Force; born March 16, 1927, Moscow; died April 24, 1967, when the Soyuz 1 parachutes tangled during descent; was married, two children.

Attended Moscow Air Force School, Third Sassov Air Force School, Serov Flying School in Bataisk, and the Zhukovskiy Air Force Engineering Academy, and joined the cosmonaut corps in 1960. He was backup pilot for Vostok 4, command pilot of Voskhod 1, and pilot of Soyuz 1.

Vladimir Vasilyevich Kovalyonok; Colonel, Soviet Air Force; born March 3, 1942, Beloye, Minsk Region; married, two children.

Graduated from Balashov Higher Air Force School in 1963, became a crew commander on transport planes and an Air Force paratroop instructor, took part in controlling manned space flights, and graduated from the Yuri Gagarin Air Force Academy in 1976. He joined the cosmonaut corps in 1967, was commander for Soyuz 25/Salyut 6 and commander for the Soyuz 29/Soyuz 31/Salyut 6 mission, and commander for the Soyuz T-4/Salyut 6 mission.

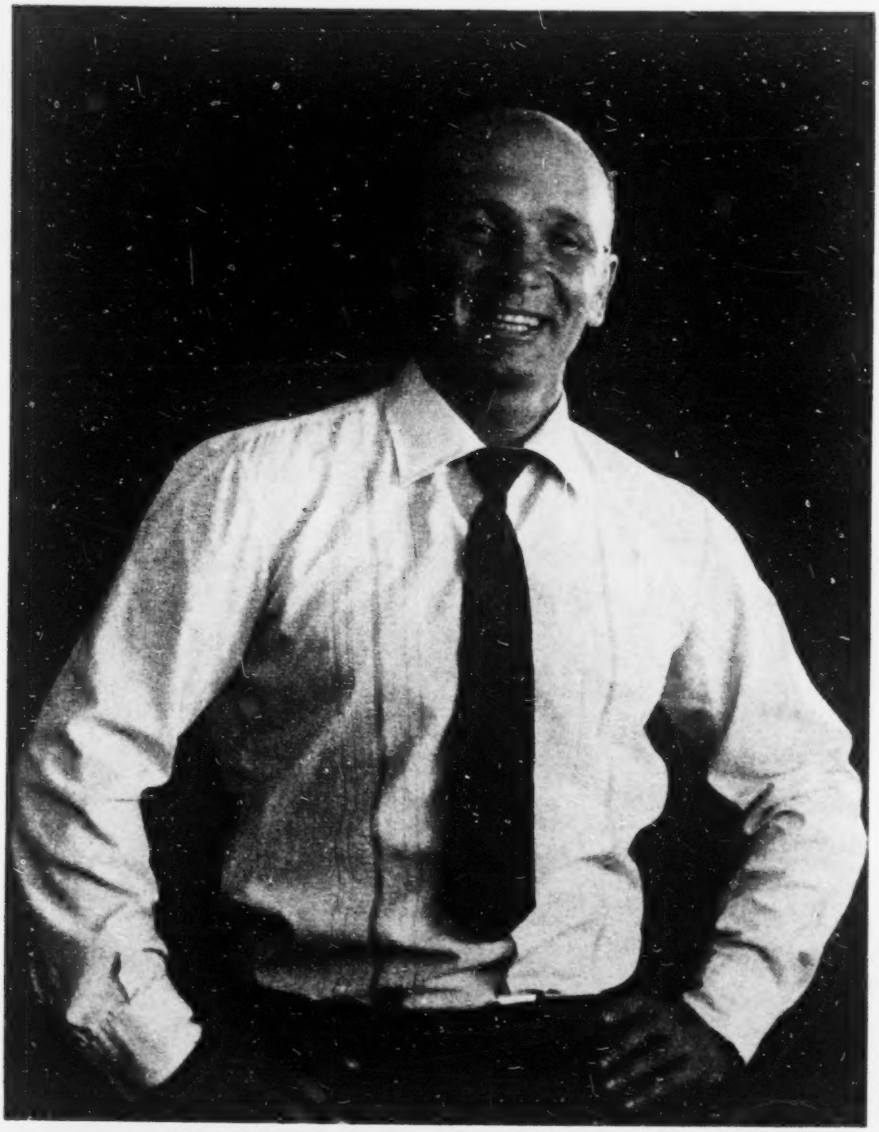


Valeri Nikolayevich Kubasov; civilian; born January 7, 1935, Vyaznika; married, two children.

Graduated as mechanical engineer for aircraft building from the Moscow Aviation School (1958), received a master of science degree (1968), and joined the cosmonaut corps in 1966. He was the backup technical scientist for Soyuz 5, flight engineer for Soyuz 6, and flight engineer for the Apollo-Soyuz Test Project, and commander for the Soyuz 36/Soyuz 35/Salyut 6 mission.

Vasili Grigor'yevich Lazarev; Colonel, Soviet Air Force; born February 23, 1928, Altai region of Southern Siberia; married, one child.

Received medical degree specializing in aviation medicine (1952), entered the Chuguyev Air Force School, since 1954 has been an air force flyer, flight instructor, test pilot and flight equipment tester, Lazarev was originally selected for the cosmonaut corps in 1964, stepped down, and was re-selected in 1966. From 1966–1982, he served as training manager for the Interkosmos program. He was the backup pilot for Soyuz 9, command pilot of Soyuz 12, and of the April 5 Anomaly.



Valentin Vital'yevich Lebedev; civilian; born April 14, 1942, Moscow; married, one child.

Graduated from the Moscow Aviation Institute (1966), worked as an engineer in a design bureau, and joined the cosmonaut corps in 1972. He was the flight engineer on Soyuz 13, and was a prime crew member for Soyuz 35 until he sustained a knee injury and was replaced by Ryumin. He was the flight engineer on Soyuz T-5/Soyuz T-7/Salyut 7, spending 211 days in space, a record at that time.

Aleksei Arkhipovich Leonov; Major General, Soviet Air Force; born May 30, 1934, Listvayanka, Altay region; married, two children.

Graduated from Chuguyev Air Force School, the Zhukovskiy Air Force Engineering Academy, and joined the cosmonaut corps in 1960. He was the co-pilot of Voskhod 2 (first man to perform extravehicular activity), and was command pilot for the Apollo-Soyuz Test Project. He is currently head of the Interkosmos program.

Vladimir Afanasevich Lyakhov; Colonel, Soviet Air Force; born July 20, 1941, in Antrasit, Ukraine; married, two children.

Graduated from the Kharkov Higher Air Force School in 1964, served in the Air Force, and joined the cosmonaut corps in 1967. He graduated from the Gagarin Air Force Academy in 1977. He was commander of the Soyuz 32/Soyuz 34/Salyut 6 mission, and of Soyuz T-9/Salyut 7.

Oleg Grigor'yevich Makarov; civilian; born January 6, 1933, Kalinin region near Moscow; married, two children.

Graduated with an engineering degree from Moscow's Higher Technical School (1957), joined a design bureau where he took part in developing the control board of the Vostok spaceship as well as in designing the Voskhod and Soyuz ships, and joined the cosmonaut corps in 1966. He was the backup flight engineer for Soyuz 9 and flight engineer for Soyuz 12, the April 5 Anomaly, and Soyuz 27/Salyut 6, and Soyuz T–3/ Salyut 6.

Yuri Vasilyevich Malyshev; Colonel, Soviet Air Force; born August 27, 1941, Nikolayevsk, near Volgograd; married, two children.

Graduated from Higher Air Force School in 1963, from Gagarin Air Force Academy in 1977, and joined cosmonaut corps in 1967, was commander of Soyuz T-2/Salyut 6. He was a primary crew member for Soyuz T-6/Salyut 7 until he was replaced due to illness. He was again commander of Soyuz T-11/Salyut 7.

Andriyan Grigor'yevich Nikolayev; Major General, Soviet Air Force; born September 5, 1929, Shorshely, Chuvash Autonomous Republic; unmarried, one child (by a previous marriage).

Graduated as a pilot from an Air Force School (1954), joined the cosmonaut corps in 1960, and graduated from Zhukovskiy Air Force Engineering Academy (1968). He was backup pilot for Vostok 2, pilot of Vostok 3, and commander of Soyuz 9. Nikolayev is deputy chairman of the Gagarin Cosmonaut Training Center.

Viktor Ivanovich Patsayev; civilian; born June 19, 1933, Aktybinsk, Kazakhstan; died June 29, 1971, during Soyuz 11 reentry; was married, two children.

Graduated from the Penzensk Industrial Institute (1955), joined the cosmonaut corps in 1969, and earned a master of science degree (1971). He was the test engineer on Soyuz 11/ Salyut 1.

Leonid Ivanovich Popov: Colonel, Soviet Air Force; born August 31, 1945, Aleksandriya, Kirovogard Region, Ukraine; married, one child.

Graduated from Yuri Gagarin Air Force Academy, attended Air Force College in Chernigov, joined the cosmonaut corps in 1970. He was commander of the Soyuz 35/Soyuz 37/Salyut 6 mission which spent a record 185 days in space, was commander of Soyuz 40/Salyut 6, and commander of Soyuz T-7/Soyuz T-5/Salyut 7.

Pavel Romanovich Popovich; Major General, Soviet Air Force; born October 5, 1930, Uzin, Kiev region; married, two children. Graduated from an industrial technicum (1951), a military aviation school (1954), Zhukovskiy Air Force Engineering Academy (1968), and joined the cosmonaut corps in 1960. He was the pilot of Vostok 4 and command pilot of Soyuz 14/Salyut 3. General Popovich has written an autobiographical work entitled *Takeoff in the Morning.*

Yuri Viktorovich Romanenko: Colonel, Soviet Air Force; born August 1, 1944, Orenburg Region; married, two children.

Graduated from the Chernigov Higher Air Force School as a pilot engineer (1966) and joined the cosmonaut corps in 1970. He graduated from the Gagarin Air-Force Academy in 1981. He was the backup command pilot of Soyuz 16, a member of the third backup crew for the Apollo-Soyuz Test Project, commander of Soyuz 26/Salyut 6, and Soyuz 38/Salyut 6.

Valeri Il'yich Rozhdestvenski; Colonel Engineer, Soviet Air Force; born February 13, 1939, Leningrad; married, one child.

Graduated with a degree in naval engineering from Dzerzhinsky Higher School (1961), commanded a unit of Baltic Fleet rescue divers, and joined the cosmonaut corps in 1965. He was flight engineer for Soyuz 23/Salyut 5.

Nikolay Nikolayevich Rukavishnikov; civilian; born September 18, 1932, Tomsk, Siberia; married, one child.

Graduated from the Moscow Engineering and Physics Institute (1957), and joined the cosmonaut corps in 1967. He was the test engineer for Soyuz 10, flight engineer for Soyuz 16, was a member of the first backup crew for the Apollo-Soyuz Test Project, and was commander for Soyuz 33. He was a member for Soyuz T-11 until he was replaced due to illness. Rukavishnikov is currently head of the Federation of Cosmonautics.

Valeriy Viktorovich Ryumin; civilian; born August 16, 1939, Komsomolsk-on-Amur, Siberia; married, two children.

Graduated from a technicum, served with the Army, graduated from the Moscow forestry school's Department of Electronics, worked in a design bureau developing new models of space equipment, and participated in controlling manned space flights. He joined the cosmonaut corps in 1973 and was flight engineer for Soyuz 25/Salyut 6, the Soyuz 32/Soyuz 34/Salyut 6 mission, and for the Soyuz 35/Soyuz 37/Salyut 6 mission. Ryumin has spent more time in space than any other person (approximately 362 days).

Gennadi Vasil'yevich Sarafanov; Colonel, Soviet Air Force; born January 1, 1942, near Saratov; married, two children.

Graduated from Balashov Higher Air Force Flying School served in various air units, and joined the cosmonaut corps in 1965. He was the commander of Soyuz 15/Salyut 3.

Viktor Savinykh; civilian, born March 7, 1940, village of Berezkiniy, Kirov region.

Graduated from Perm technical school of railway transport (1960), worked on the railway, served in the Soviet Army, graduated from the Moscow Institute of Engineers of Geodetics, Aerial Photography and Cartograph (1969), and worked in a design office. He joined the cosmonaut corps in 1978 and was flight engineer for Soyuz T-4/Salyut 6.

Svetlana Yevgenyevna Savitskaya; civilian; born August 8, 1948, Moscow; married.

Daughter of Yevgeny Y. Savitsky, former Air Marshal and Deputy Commander of Soviet Air Defenses. She became a parachutist and pilot as a teenager and set records in both. She is a mechanical engineer and attended Moscow Aviation Institute. She was a pilot cosmonaut on Soyuz T-7/Soyuz T-5/Salyut 7, becoming the second woman in space. Savitskaya also flew on Soyuz T-12/Salyut 7 and was the first woman to walk in space.

NO PHOTOGRAPH AVAILABLE

Aleksandr Aleksandrovich Serebrov; civilian; born February 15, 1944, Moscow; married.

Graduated from the Moscow Institute of Physical Engineering (1967), worked as researcher at the Institute for 9 years, and beginning in 1976 worked at a design bureau developing and testing spacecraft. He joined the Cosmonaut Corps in 1978. He was flight engineer and pilot cosmonaut on Soyuz T-7/Soyuz T-5/Salyut 7, and a research engineer on Soyuz T-8.

Vitaliy Ivanovich Sevast'yanov; civilian; born July 8, 1935, Krasnouralsk, Sverdlovsk region; married, one child.

Graduated from the Moscow Aviation Institute (1959), earned a master of science degree in engineering from the Institute (1965), and joined the cosmonaut corps in 1967. He was the flight engineer on Soyuz 9 and Soyuz 18/Salyut 4.

Vladimir Aleksandrovich Shatalov; Lieutenant General, Soviet Air Force; born December 8, 1927, Petropavlovsk, Kazakhstan; married, two children.

Graduated from the Kachinsk Air Force College (1949), enrolled in the Air Force Academy in Moscow in 1953, and joined the cosmonaut corps in 1963. He was the backup pilot of Soyuz 3, command pilot of Soyuz 4, command pilot of Soyuz 8, and command pilot of Soyuz 10/Salyut 1. General Shatalov is currently the Cosmonaut Corps Director of Flight Training.

Georgiy Stepanovich Shonin; Major General, Soviet Air Force; born August 3, 1935, Rovenki, the Ukraine; married, two children.

Attended Naval Air Force College, Zhukovskiy Air Force Engineering Academy, and joined the cosmonaut corps in 1960. He was backup command pilot for Soyuz 5, and command pilot of Soyuz 6. He has written a book, *The Very First Ones*, published in 1977. Shonin is currently working at the Gagarin Cosmonaut Training Center.

Vladimir Alekseyevich Solovyov; civilian, born November 11, 1946, Moscow; married, two children.

Graduated from Bauman Moscow Institute of Higher Technology in 1970. He joined the cosmonaut corps in 1978 and was the backup flight engineer for Soyuz T-6/Salyut 7. Solovyov was the flight engineer on Soyuz T-10, the mission which lasted a record 237 days.

Gennadiy Mikhaylovich Strekalov; civilian; born October 28, 1940, Mytishchi, Moscow Region; married.

Graduated from the Bauman Higher Technical School in Moscow, and worked in the design bureau that has produced most of the Soviet cosmonaut-engineers. He was research engineer for Soyuz T-3/Salyut 6, and flight engineer on Soyuz T-8/Salyut 7. Strekalov replaced Rukavishnikov to become a crewmember on the aborted flight of Soyuz T-10. He later flew on Soyuz T-11/Salyut 7.

Valentina Vladimirovna Nikolayevna-Tereshkova; Colonel Engineer, Soviet Air Force; born March 6, 1937, Maslennikovo, Yaroslav region; unmarried, one child (by a previous marriage).

Graduated from a textile technical school and joined the cosmonaut corps in 1962. She was the pilot of Vostok 6, becoming the first woman to have flown in space, and left the program just after her space flight in 1963. She graduated from the Zhukovsky Air Force Engineering Academy.

German Stepanovich Titov; Lieutenant General, Soviet Air Force; born September 11, 1935, Verkhneye Zhilino, Kosikha district, Altay region; married, two children.

Graduated from Volgograd Military Aviation College (1957) and joined the cosmonaut corps in 1960. He was the backup pilot for Vostok 1 and pilot for Vostok 2. In 1968, Colonel Titov graduated from the Zhukovskiy Air Force Engineering Academy, and is currently Assistant to the Chief Editor of the Journal of Aviation and Cosmonautics.

NO PHOTOGRAPH AVAILABLE

Vladimir Titov; Colonel, Soviet Air Force; born January 1, 1947, Svetinsk Chita Region; married.

Graduated from Air Force College in Chernigovsk, 1970, and then served in the Air Force. He was selected in the 1976 cosmonaut group, and served as back-up crew for Soyuz-35, Soyut T-4, Soyuz T-5, and Soyuz T-9. Titov was assigned to the aborted Soyuz T-10 flight in 1984, and flew on Soyuz T-8 which failed to dock with Salyut 7.

NO PHOTOGRAPH AVAILABLE

Igor Volk; civilian, born April 12, 1937, Gottwald Kharkhov Oblast, Ukraine.

Served in the Air Force after graduation from Kirovogard Military Aviation School for Pilots in 1956. Served in the armed forces. He joined the cosmonaut corps in 1978 and flew on Soyuz T-12 as a cosmonaut researcher.

Vladislav Nikolayevich Volkov; civilian; born November 23, 1935, Moscow; died June 29, 1971, during Soyuz 11 reentry; was married, one child.

Entered Moscow Aviation Institute in 1953, worked as an engineer, and joined the cosmonaut corps in 1966. He was the flight engineer on Soyuz 7 and Soyuz 11/Salyut 1. His autobiography, *We're Stepping into the Sky,* was published

Boris Valentinovich Volynov; Colonel, Soviet Air Force; born December 18, 1934, Irkutsk, Siberia; married, two children.

Attended Zhukovskiy Air Force Engineering Academy and joined the cosmonaut corps in 1960. He was the backup pilot for Vostok 5, backup command pilot for Voskhod 1, and command pilot for Soyuz 5 and Soyuz 21/Salyut 5. He is currently commander of the Cosmonaut Group.

Boris Borisovich Yegorov; civilian, born November 26, 1937, Moscow; married, one child.

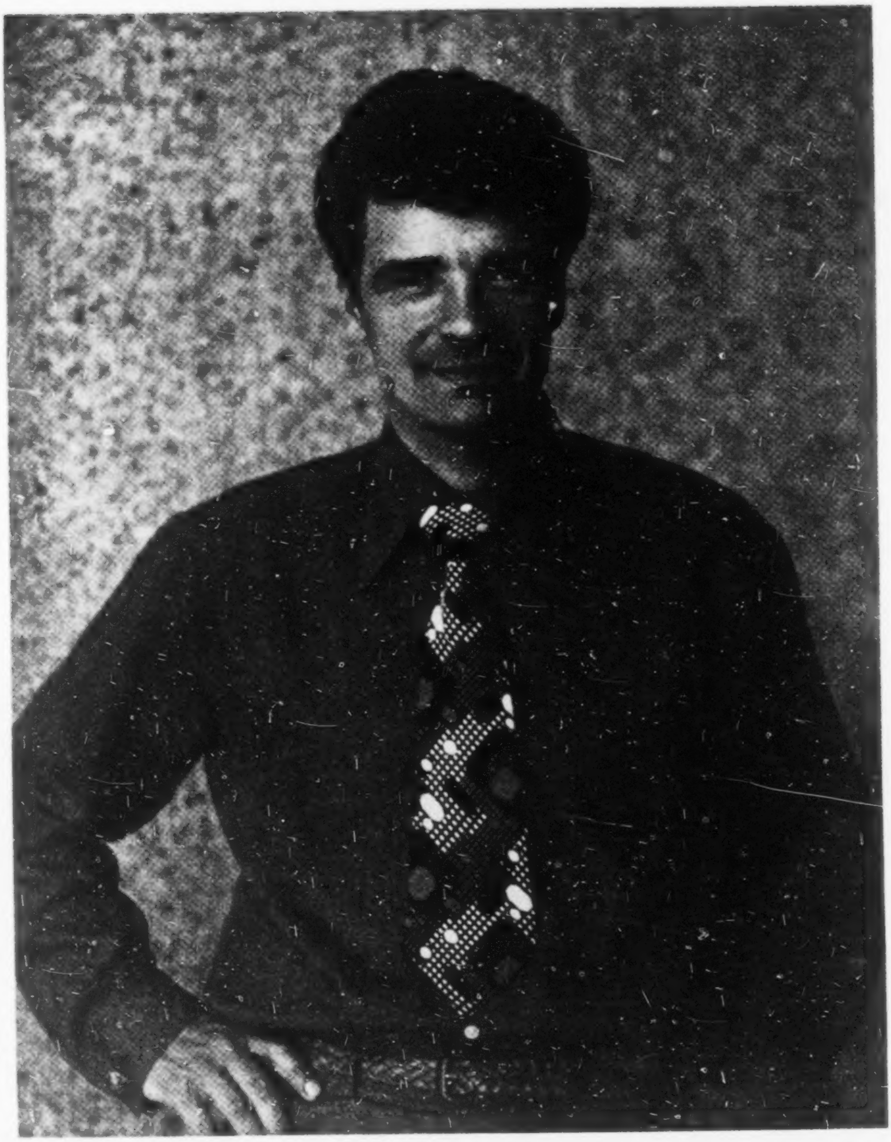
Graduated from the First Medical Institute in 1961, joined the cosmonaut corps in 1964, received a Doctor of Medicine degree from the Humboldt Unversity of Berlin (1965), and became a candidate of medical sciences in 1967. He was the physiologist for Voskhod 1, and gave up his temporary role as a cosmonaut to return to medicine shortly after his space flight. Yegorov is currently head of a medical laboratory.

Aleksey Stanislavovich Yeliseyev; civilian; born July 13, 1934, Zhizdra; married, one child.

Attended Bauman Technical High School in Moscow, received master of technical science degree in engineering, and joined the cosmonaut corps in 1966. He was the technical scientist for Soyuz 4 and 5, transferring in flight from Soyuz 5 to Soyuz 4, technical scientist for Soyuz 8 and Soyuz 10. He was the Soviet flight director for the Apollo-Soyuz Test Project, and flight director for Salyut 6.

Vitaliy Mikhaylovich Zholobov; Colonel Engineer, Soviet Air Force; born June 18, 1937, Zburyevka, Ukraine; married, one child.

Graduated from the Azerbaydzhan Oil and Chemistry Institute with a degree in chemistry (1959), joined the Army as a test engineer, and joined the cosmonaut corps in 1963. He was backup flight engineer for Salyut 3 (for both Soyuz 14 and Soyuz 15) and flight engineer for Soyuz 21/Salyut 5/.



Vyacheslav Dmitriyevich Zudov; Colonel, Soviet Air Force; born January 8, 1942, Bor; married, two children.

Graduated from Balashov Air Force School (1963), became a transport pilot, and joined the cosmonaut corps in 1965. Zudov is a graduate of the Gagarin Air Force Academy. He was command pilot of Soyuz 23/Salyut 5.

TABLE 4-3

SUMMARY OF SOVIET COSMONAUTS

Name	Year Chosen	Service/Rank	Flights	Comments
Aksenov	1973	Civilian	Soyuz 22 Soyuz T-2/Salyut 6	
Aleksandrov	1978	Civilian	Soyuz T-10/Salyut 7	
Andreyev	1970	Civilian	none	Backup flight engineer for the Apollo-Soyuz Test Project (Soyuz 19
Artyukhin	1963	AF/Col. Eng.	Soyuz 14/Salyut 3	
Atkov	1977	Civilian	Soyuz T-10	Spent a record 237 consecutive days in space.
Belyayev	1960	Naval AF/Col.	Voskhod 2	Died of complications following surgery for stomach ulcers in January 1970.
Beregovoi	1964	AF/Lt. Gen.	Soyuz 3	
Berezovoi	1970	AF/Col.	Soyuz T-5/Soyuz T-7/Salyut 7	
Bykovskiy	1960	AF/Col.	Vostok 5 Soyuz 22 Soyuz 31/Soyuz 29/Salyut 6	
Demin	1963	AF/Col. Eng.	Soyuz 15/Salyut 3	
Dobrovolsky	1963	AF/Lt. Col.	Soyuz 11/Salyut 1	Killed during the reentry of Soyuz 11.

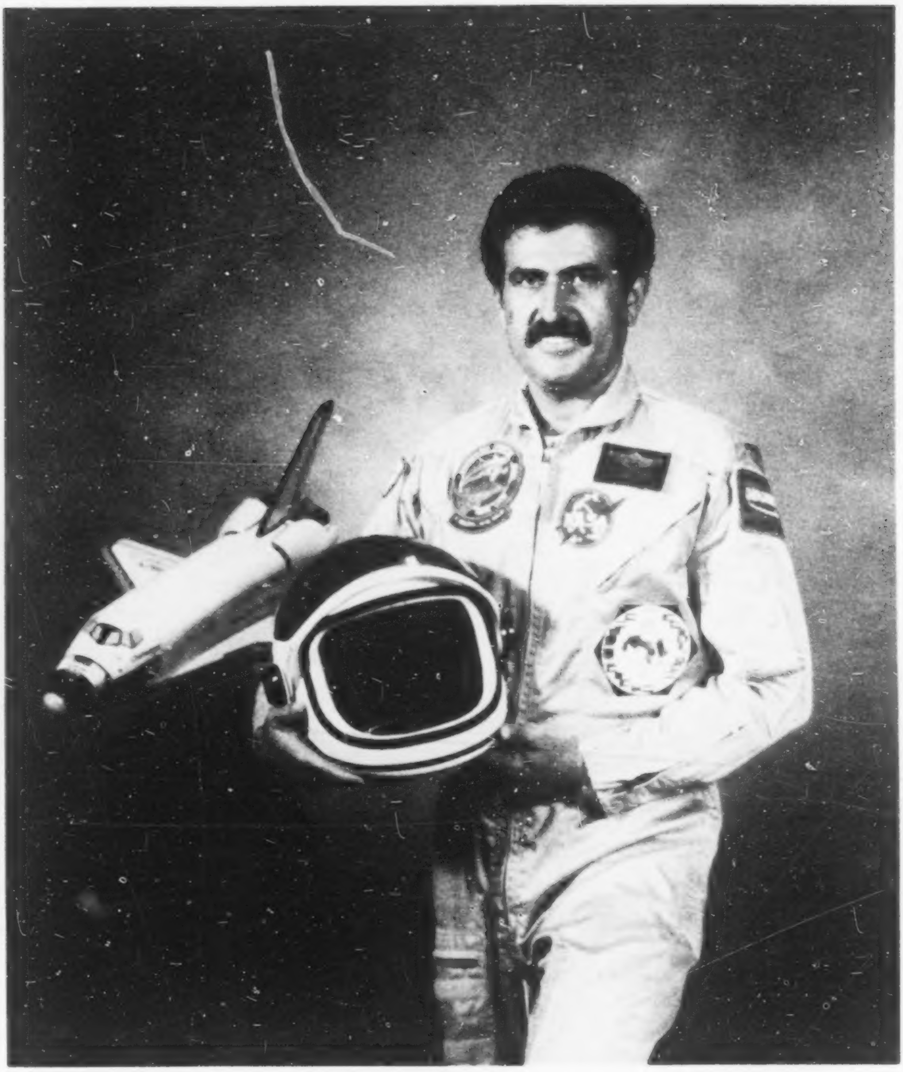
CHAPTER FIVE

NON-U.S., NON-SOVIET SPACENAUTS

The term "spacenaut" is used here to denote individuals who have flown or will fly into space, but are neither from the United States nor the Soviet Union. This includes 11 individuals who have flown on Soviet space missions and their backups. NASA has flown four individuals from other countries on the space shuttle, including two from the European Space Agency, one from Canada, and one from Saudi Arabia. These men and their back-ups were trained as payload specialists by NASA, along with individuals from the United Kingdom and West Germany. In the future, NASA expects to fly payload specialists from Mexico, Japan, Indonesia, and possibly India.

Individuals who fly on Soviet space missions are given approximately two years of training prior to their flight. In most cases, it is assumed that the backup spacenauts will not make a flight. One exception to this is in the case of the French who are discussing the possibility of a second flight with the Soviet Union.

In the case of flights on-board the space shuttle, payload specialists generally will be given a short period of training (160 hours during a three to six month period), although two spacenauts (Merbold and Nicollier) participated in the one-year NASA mission specialist training program with the 1980 class of U.S. astronaut candidates. One of these (Merbold) was a payload specialist for Spacelab 1. NASA revised its policy concerning payload specialists in 1982 to create more opportunities for both American and foreign individuals to fly on the shuttle.



A. NON-U.S., NON-SOVIET SPACENAUTS BIOGRAPHIES

Abdulmohsen Hamad Al-Basm; Major, Saudi Royal Air Force; born December 12, 1948, Onaisah, Saudi Arabia; married, two children.

Received bachelor of air science from King Faisal Air Academy in Riydah; attended Pilot Instructor School, Instrument Pilot Instructor School, Instructor Training School at Randolph AFB, Texas; and Weapons and Tactics Instructor School, Williams AFB, Arizona. Selected as backup payload specialist by the Arab Satellite Communication Organization. The second Arabsat was launched on STS 51-G.

Alexander Alexandrov; Captain-Engineer, Bulgarian Air Force, born December 1, 1951, Omourtag, Bulgaria; unmarried.

Graduated from the Georgi Benkovski Higher Air Force School in 1974 and was selected as the second Bulgarian cosmonaut in 1978. He served as backup cosmonaut researcher for Soyuz 33.

Sultan, Salman Al-Saud; born June 27, 1956, Riyadh, Saudi Arabia; single.

Received bachelor of arts degree in mass communications, University of Denver. He is currently acting director, Saudi Arabian Television Commercial Department. Al-Saud is an experienced pilot with a commercial pilot's license. He was a payload specialist on STS 51-G, which launched the second Arabsat.

CNES
PATRICK
NASA
NASA

Patrick Baudry; Major, French Air Force; born March 6, 1946, Douala, United Republic of the Cameroon; married, one child.

Received master in aeronautical engineering (1969) and fighter pilot's certificate (1970), French Air Force Academy. He later completed the British test pilot course ETOS. Baudry was selected as a CNES astronaut in 1980, and trained at CNES and at Star City, near Moscow for two years. He was backup crew for CNES studies for the proposed Hermes manned spacecraft. He served as a payload specialist on STS 51-G.

TABLE 4-3 (cont.)

Name	Year Chosen	Service/Rank	Flights	Comments
Dzhanibekov	1970	AF/Col.	Soyuz 27/Salyut 6 Soyuz 39/Salyut 6 Soyuz T-6/Salyut 7 Soyuz T-12/Salyut 7	
Feoktistov	1964	Civilian	Voskhod 1	Returned to high level design engineering.
Filipchenko	1963	AF/Maj. Gen.	Soyuz 7 Soyuz 16	
Gagarin	1960	AF/Col.	Vostok 1	First man in space. Killed in the crash of a jet trainer in 1968.
Glazkov	1965	AF/Col. Eng.	Soyuz 24/Salyut 5	
Gorbatko	1960	AF/Maj. Gen.	Soyuz 7 Soyuz 24/Salyut 5 Soyuz 37/Soyuz 36/Salyut 6	
Grechko	1966	Civilian	Soyuz 17/Salyut 4 Soyuz 26/Salyut 6	
Gubarev	1963	AF/Col.	Soyuz 17/Salyut 4 Soyuz 28/Salyut 6	
Illarionov	1970	AF/?	none	Participated as a capcom for Apollo-Soyuz Test Project.
Ivanchenkov	1970	Civilian	Soyuz 29/Soyuz 31/Salyut 6 Soyuz T-6/Salyut 7	
Khrunov	1960	AF/Col. Eng.	Soyuz 4/Soyuz 5	Transferred in space (via extravehicular activity) from Soyuz 5 to Soyuz 4.

TABLE 4-3 (cont.)

Name	Year Chosen	Service/Rank	Flights	Comments
Kizim	1965	AF/Lt. Col.	Soyuz T-3/Salyut 6	
Klimuk	1965	AF/Maj. Gen.	Soyuz 13 Soyuz 18/Salyut 4 Soyuz 30/Salyut 6	Deputy head of Gagarin Cosmonaut Training Center.
Komarov	1960	AF/Col. Eng.	Voskhod 1 Soyuz 1	Killed upon impact with Earth when the Soyuz 1 parachute lines tangled during descent.
Kovalyonok	1967	AF/Col.	Soyuz 25/Salyut 6 Soyuz 29/Soyuz 31/Salyut 6 Soyuz T-4/Salyut 6	
Kubasov	1966	Civilian	Soyuz 6 Soyuz 19 Soyuz 36/Soyuz 35/Salyut 6	
Lazarev	1966	AF/Col.	Soyuz 12 April 5 Anomaly	
Lebedev	1972	Civilian	Soyuz 13 Soyuz T-5/Soyuz T-7/Salyut 7	
Leonov	1960	AF/Maj. Gen.	Voskhod 2 Soyuz 19	First man to perform extravehicular activity.
Lyakhov	1967	AF/Col.	Soyuz 32/Soyuz 34/Salyut 6 Soyuz T-9/Salyut 7	
Makarov	1966	Civilian	Soyuz 12 April 5 Anomaly Soyuz 27/Salyut 6 Soyuz T-3/Salyut 6	

TABLE 4-3 (cont.)

Name	Year Chosen	Service/Rank	Flights	Comments
Malyshev	1967	AF/Col.	Soyuz T-2/Salyut 6 Soyuz T-11/Salyut 7	
Nikolayev	1960	AF/Maj. Gen.	Vostok 3 Soyuz 9	Deputy Chairman, Gagarin Cosmonaut Training Center.
Patsayev	1969	Civilian	Soyuz 11/Salyut 1	Killed during reentry of Soyuz 11.
Popov	1970	AF/Col.	Soyuz 35/Soyuz 37/Salyut 6 Soyuz 40/Salyut 6 Soyuz T-7/Soyuz T-5/Salyut 7	
Popovich	1960	AF/Maj. Col.	Vostok 4 Soyuz 14/Salyut 3	
Romanenko	1970	AF/Col.	Soyuz 26/Salyut 6 Soyuz 38/Salyut 6	
Rozhdestvenski	1965	AF/Col. Eng.	Soyuz 23/Salyut 5	
Rukavishnikov	1967	Civilian	Soyuz 10/Salyut 1 Soyuz 16 Soyuz 33	Head of Federation of Cosmonautics.
Ryumin	1973	Civilian	Soyuz 25/Salyut 6 Soyuz 32/Soyuz 34/Salyut 6 Soyuz 35/Soyuz 37/Salyut 6	Has spent a record 362 days in space, including consecutive flights of 175 and 185 days.
Sarafanov	1965	AF/Col.	Soyuz 15/Salyut 3	
Savinykh	1978	Civilian	Soyuz T-4/Salyut 6	
Savitskaya	1980	Civilian	Soyuz T-7/Soyuz T-5/Salyut 7 Soyuz T-12/Salyut 7	Second woman in space. First woman to perform EVA.
Serebrov	1978	Civilian	Soyuz T-7/Soyuz T-5/Salyut 7 Soyuz T-8	

TABLE 4-3 (cont.)

Name	Year Chosen	Service/Rank	Flights	Comments
Sevast'yanov	1967	Civilian	Soyuz 9 Soyuz 18/Salyut 4	
Shatalov	1963	AF/Lt. Gen.	Soyuz 4 Soyuz 8 Soyuz 10/Salyut 1	Cosmonaut Corps Director of Flight Training.
Shonin	1960	AF/Maj. Gen.	Soyuz 6	
Solovyov	1978	Civilian	Soyuz T-10/Salyut 7	Set new duration record of 237 consecutive days.
Strekalov	1973	Civilian	Soyuz T-3/Salyut 6 Soyuz T-10 abort Soyuz T-11/Salyut 7	
Tereshkova	1962	AF/Col. Eng.	Vostok 6	First woman to have flown in space.
Titov, G.	1960	AF/I [illegible] .d.	Vostok 2	
Titov, V.	1976	AF/Col.	Salyut T-8	
Volk	1978	Civilian	Soyuz T-12/Salyut 7	
Volkov	1966	Civilian	Soyuz 7 Soyuz 11/Salyut 1	Killed during reentry of Soyuz 11.
Volynov	1960	AF/Col.	Soyuz 5 Soyuz 21/Salyut 5	Commander, Cosmonaut Group.
Yegorov	1964	AF/Medical Lt.	Voskhod 1	
Yeliseyev	1966	Civilian	Soyuz 4/Soyuz 5 Soyuz 8 Soyuz 10/Salyut 1	
Zholobov	1963	AF/Col. Eng.	Soyuz 21/Salyut 5	
Zudov	1965	AF/Col.	Soyuz 23/Salyut 5	

Tony Boyle; Lieutenant Colonel, British Army; United Kingdom.
He was selected as a payload specialist for the Skynet team, but has since resigned.

Bui Thanh Liem; Captain, Red Star Air Regiment; born June 30, 1949, Hanoi; died 1981 in a plane crash; was married, one child.

Was chosen as a Vietnamese cosmonaut in 1979, and served as backup to Pham Tuan on the Soyuz 37/Soyuz 36/Salyut 6 mission.

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Jean-Loup Chretien; Colonel, French Air Force; born August 20, 1938, La Rochelle, France; married, four children.

Graduated from Air Force College in 1962 as a fighter pilot. He became Deputy Head of the Southern Air Defense Division. He was selected for the Franco-Soviet space program in 1980 and was the first Frenchman in space, on Soyuz T-6/Salyut 7.

Dumitru Dediu.

Selected as a Romanian cosmonaut in 1978 and served as backup crewman to Prunariu for Soyuz 40/Salyut 6.

Bertalan Farkas; Lieutenant Colonel, Hungarian Air Force; born August 2, 1949, Gyulahaza, Hungary; married, two children.

Graduated from the Gyorgy Kilian Aeronautical Engineering College, Szolnok in 1969. He joined the cosmonaut corps in 1978 as the first Hungarian cosmonaut. He was cosmonaut-researcher for the Soyuz 36/Soyuz 35/Salyut 6 mission.

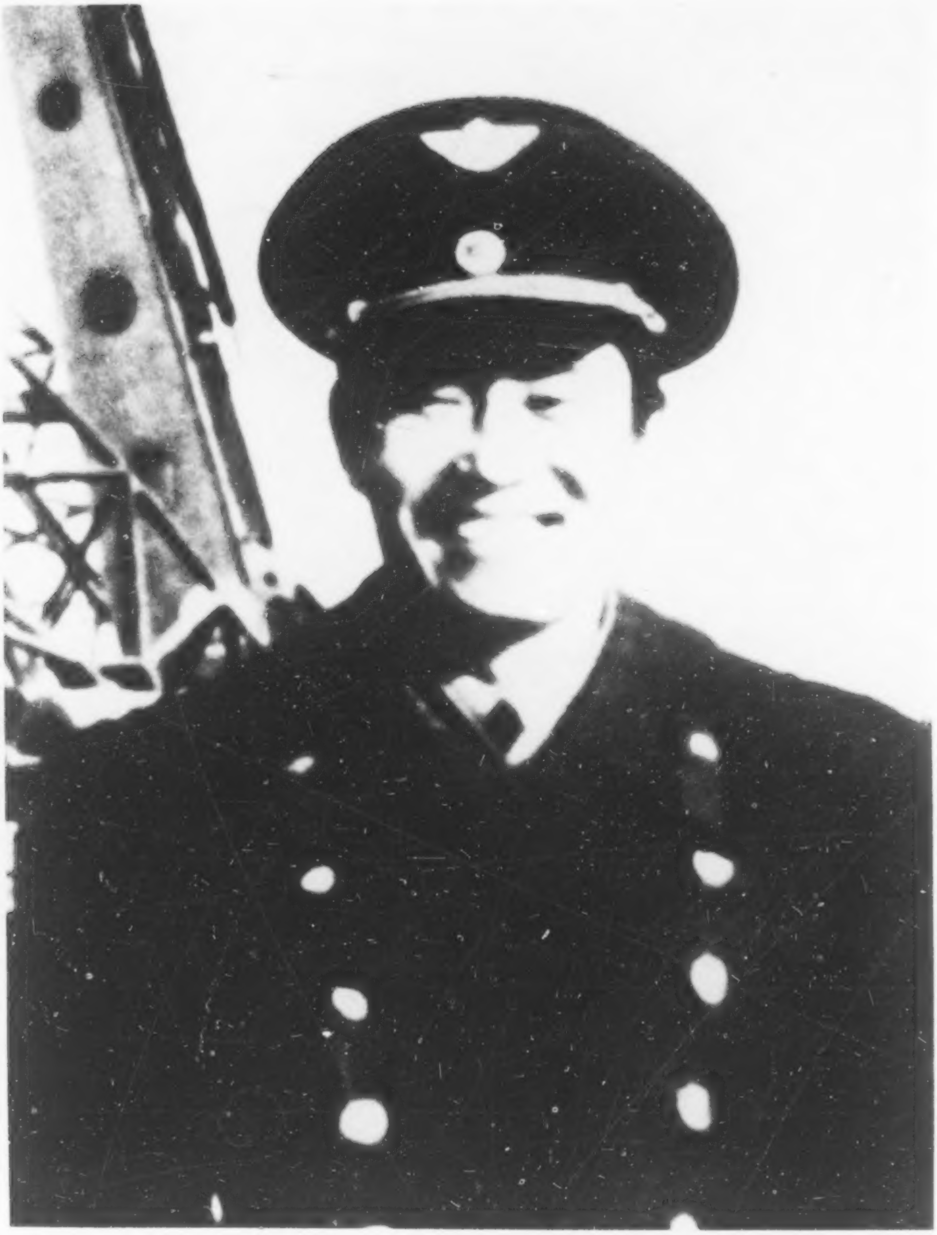
NO PHOTOGRAPH AVAILABLE

Richard A. Farrimond; Lieutenant-Colonel, British Army; born September 15, 1947, Birkenhead, Cheshire, England; married, three children.

Attended Royal Military College of Science, gaining 2nd class Division 1 honors degree in telecommunications engineering. He served in the Royal Corps of Signals and in the Military Communications Projects Division of Procurement Executive, Ministry of Defense. Farrimond was one of four U.K. payload specialists selected in 1984 and currently is in training at NASA.

einhard Furrer; Germany.

In 1983, he was selected as a payload specialist for the German dedicated Spacelab mission, Spacelab D-1, planned for late 1985.



Ganzorig.

A man named Ganzorig has been identified as having been the Mongolian backup cosmonaut for Gurragcha. No further information is available.

lark Garneau; Canada.

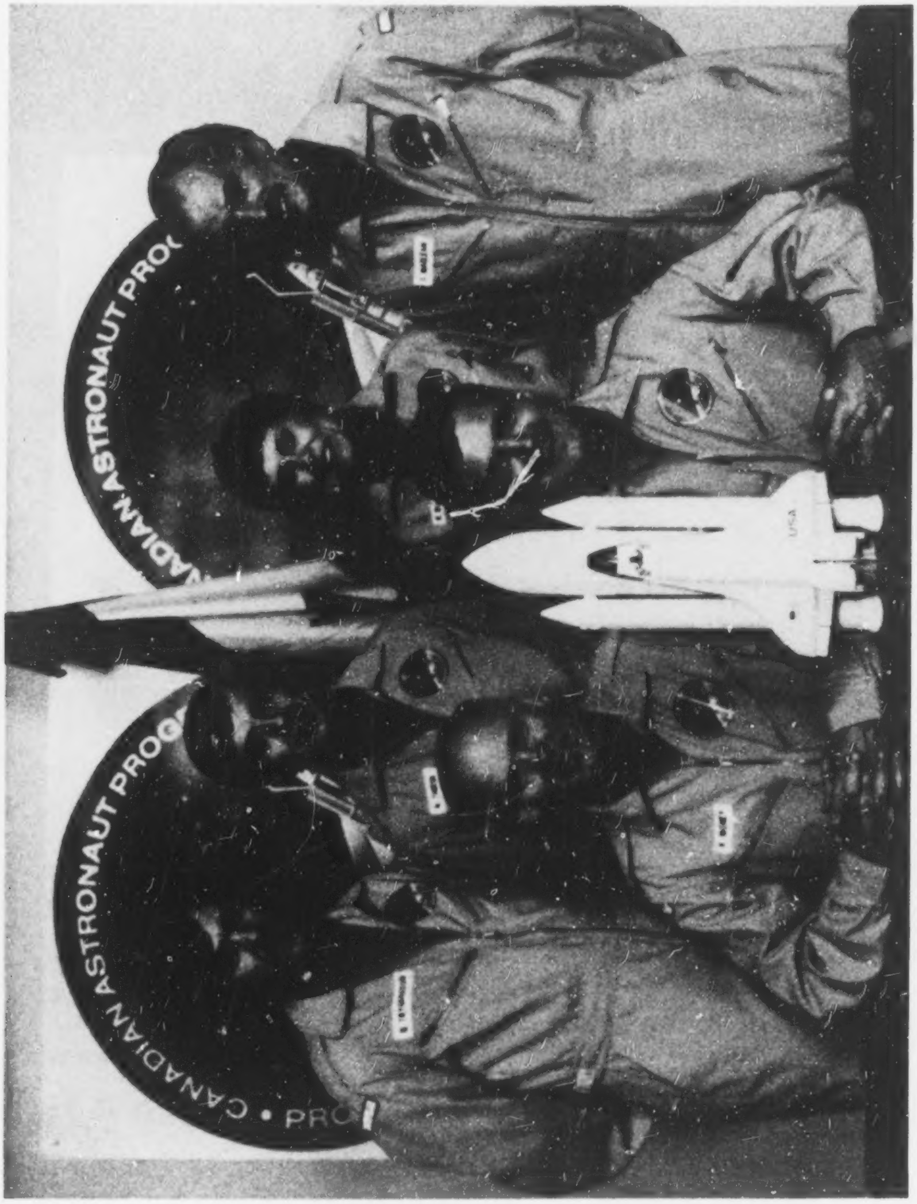
Garneau was one of six Canadian astronauts chosen. He was at the Canadian Department of National Defense in Ottawa when he was assigned to STS 41-G, becoming the first Canadian to fly in space.

Judgerdemidiyin Gurragcha; (on right) Major General, Mongolian People's Army; born December 5, 1947, in the Guran-Bulak settlement of the Bulgan Province.

Served in the Mongolian People's Army beginning in 1978. Graduated from a military school of aircraft technicians in the Soviet Union and from the Zhukovskiy Air Force Academy. He joined the cosmonaut corps in 1978 and was cosmonaut researcher of Soyuz 39/Salyut 6.

Miroslaw Hermanszewski; Colonel, Polish Air Force; born September 15, 1941, Lipniki, Poland; married, two children.

Graduated from the Officers Flying School at Deblin in the 1964 and from the Karol Swierczewski General Staff Academy in 1971. He was selected as the first Polish cosmonaut in 1976. He was cosmonaut-researcher for Soyuz 30/Salyut 6.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Roberta Lynn Bondar; Canada.

She is one of six Canadian astronauts selected in 1983, and began training in 1984. Bondar is a physician from the McMaster University Medical Center, Hamilton.

Georgi Ivanov; Colonel, Bulgarian Air Force; born July 2, 1940, Lovech, Bulgaria; married, one child.

Graduated from the Georgi Benkovski Higher Air Force School in 1964, served in the Bulgarian Air Force, and was selected as the first Bulgarian cosmonaut in March 1978. He was cosmonaut-researcher on Soyuz 33.

Sigmund Jähn; Colonel, German Democratic Republic Air Force; born February 3, 1937, Rautenkranz, Germany.

Graduated from Gagarin Air Force Academy in 1966, was selected as East German cosmonaut in 1976, and was cosmonaut-researcher for the Soyuz 31/Soyuz 29/Salyut 6 mission.

Zenon Jankowski; Colonel, Polish Air Force; born November 22, 1937, Poznan, Poland; married, one child.

Attended Air Force Officers School at the Karol Swierczewski General Staff Academy. He was selected as the second Polish cosmonaut in 1976 and was backup to Hermaszewski for Soyuz 30.

Eberhard Kollner; Lieutenant Colonel, GDR Air Force; born September 29, 1939, Strassfurt; married, two children.

Graduated from Franz Mering Higher Air Force School, and from the Yuri Gagarin Air Force Academy (1970). He was the backup cosmonaut-researcher for Soyuz 31.

Peter Longhurst; Commander, Royal Navy; born 1943, Staines, Middlesex, England; single.

Received bachelor of science, Royal Navy Engineering College, Manadon. He served as staff for the Director of Naval Operational Requirements, Ministry of Defense and specialist for satellite communications prior to being selected as Skynet 4 payload specialist in 1984.

Jose Armando Lopez-Falcon; Captain, Cuban Air Force; born February 8, 1950, Havana; married, one child.

Joined the cosmonaut corps in 1978. Was backup cosmonaut-researcher for Tamayo-Mendez on Soyuz 38.

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Steven Glenwood MacLean; (second row, right) civilian; born December 14, 1954, Ottawa, Ontario, Canada; single.

Received bachelor of science in honors physics (1977) and doctorate in astrophysics (1983) from York University. Dr. MacLean was a visiting scholar at Stanford University under Nobel Laureate A.L. Shalow, working on electro-optics, laser induced fluorscence of particles and crystals and multiphoton laser spectroscopy. He was one of six Canadian astronauts selected in December 1983.

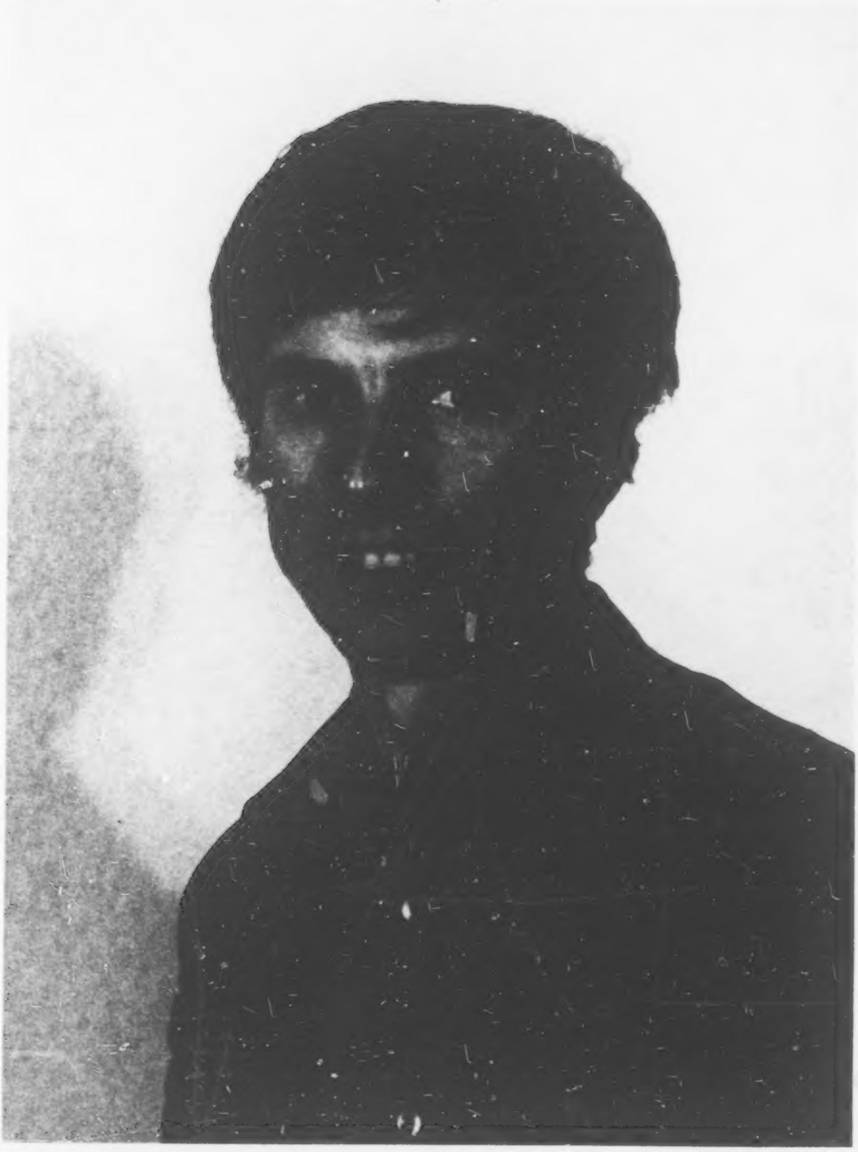
NO PHOTOGRAPH AVAILABLE

Bela MaGyari; Major, Hungarian Air Force; born August 1949, Kiskunfelegyhaza, Hungary; married, one child.

Graduated from the Gyorgy Kilian Aeronautical College, Szolnok, in 1969; and was selected as the second Hungarian cosmonaut in 1978. He served as backup to Farkas for the Soyuz 36/Soyuz 35/Salyut 6 mission.

Ravish Malhoutra; Lieutenant Colonel, Indian Air Force; married, two children.

Has been identified as one of the two Indian cosmonauts in training for a spaceflight in 1984. No further information is available.



Ulf Merbold; civilian; born 1941, Greiz, Germany; married, two children.

Received doctorate in science (1976), Stuttgart University. He worked as a solid-state physicist at the Max-Planck Institute for Metals Research. He was one of three payload specialists selected by the European Space Agency to train with NASA. Dr. Merbold flew on STS–9, the first Spacelab flight. He was the first non-American to fly on a U.S. mission. He is currently in training for the Spacelab D–1, a German dedicated Spacelab flight.

Ernst Messerschmid; civilian; born May 21, 1945, Reutlingen, Federal Republic of Germany; married.

Received diploma in physics (1972) and doctorate in physics (1976), studying at the Universities of Tubingen and Bonn. He was a visiting scientist and fellow at CERN, Geneva, and a lecturer and research associate at the Freiberg University and Brookhaven National Laboratory, New York. From 1978 to 1982, he worked at the Institute of Communication Technology, DFVLR, at Oberpfaffenhofen, conducting research in spaceborne communications. In 1983, he was selected as a member of the Spacelab D-1 project and a science astronaut for Spacelab D-1.

• CANADIAN ASTRONAUT PROG
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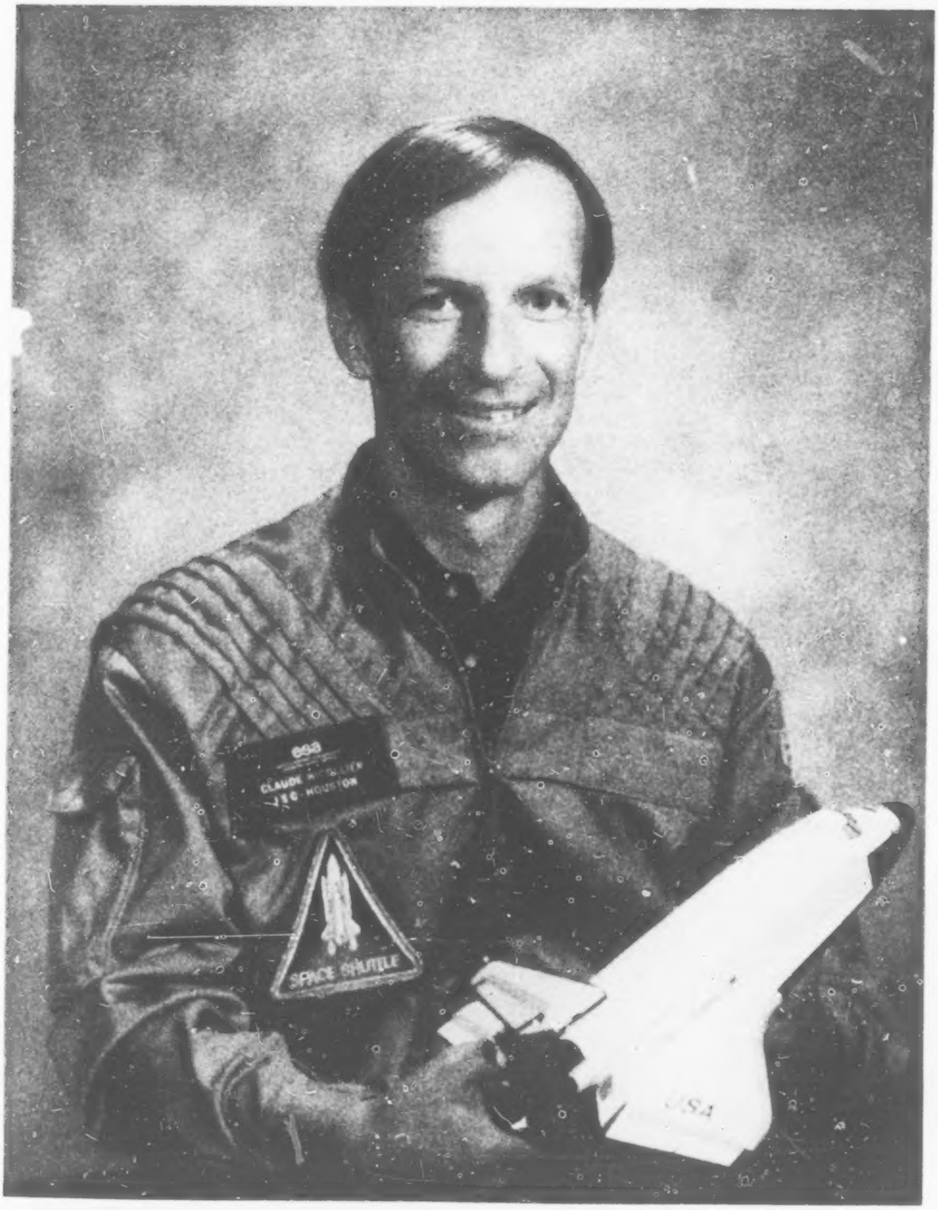
ADIAN ASTRONAUT PROG

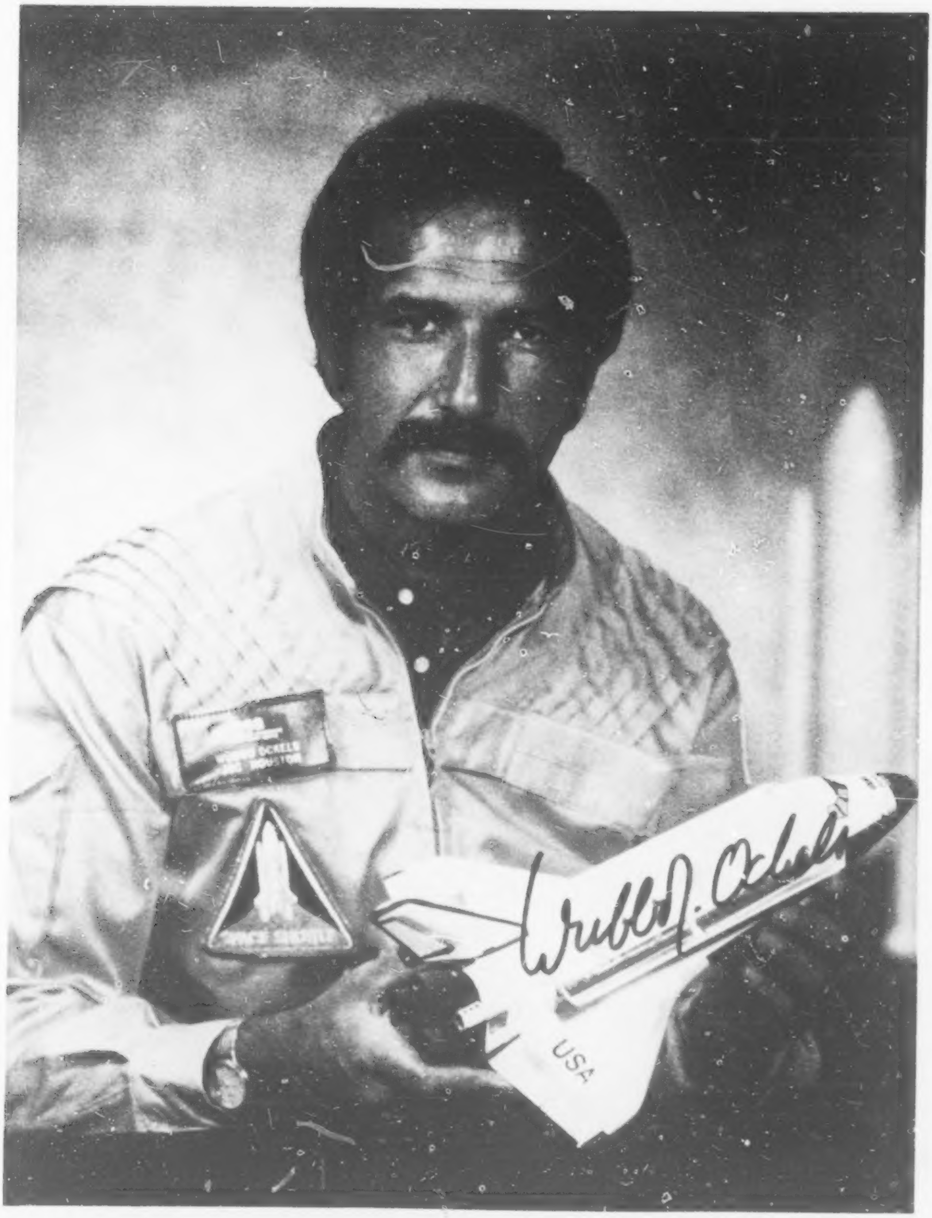
Kenneth Money; (first row, left) Canada.

He was a senior scientist at the Defense and Civil Institute of Environmental Medicine, Department of National Defense. He was one of six Canadian astronauts selected in 1983.



Claude Nicollier; First Lieutenant, Swiss Air Force; born September 2, 1944, Vevey, Switzerland; married, two children.

Received bachelor of science, University of Lausanne (1970); master of science astrophysics, University of Geneva (1975). In 1976, he began work with the European Space Agency's Space Science Department at Noordwijk, Netherlands. ESA selected him as one of three payload specialists to train for Spacelab-1. Nicollier is currently training as a mission specialist for STS 51-H.



Wubbo J. Ockels; civilian; born March 28, 1946, Almelo, Netherlands; married, two children.

Received doctorate in physics and mathematics from University of Groningen (1973). He worked at the Nuclear Physics Accelerator Institute in Groningen until his selection in 1978 by the European Space Agency as one of three payload specialists to train for Spacelab-1. He was served as back-up for the Spacelab flight and is assigned to the primary crew for the German Spacelab mission D-1.

Oldrich Pelčák; Major, Czechoslovak Air Force; born November 2, 1943, Gottwaldov, Czechoslovakia; married, two children.

Graduated from Uherske-Hradiste engineering junior college (1962); Kosice Air Force College (1965); and Gagarin Air Force Academy (1972). He was the Czechoslovak backup for Remek on Soyuz 28/Salyut 6.

Dumitru Prunariu; Major Engineer, Romanian Air Force; born September 27, 1952, Brasov, Romania; married, two sons.

Graduated from Bucharest Polytechnical Institute in 1976 and worked as an aircraft engineer. He graduated from the air force officers' school and served in the Romanian Air Force. He began cosmonaut training in 1978 and was cosmonaut researcher on Soyuz 40/Salyut 6.

Pham Tuan; Colonel, Vietnamese Air Force; born February 14, 1947, Quoc Tuan Village, Thai Binh Province.

Served in the Vietnamese People's Army, enrolled in the Soviet Air Force Academy in 1977, and joined the cosmonaut corps in 1979. He was cosmonaut-researcher on the Soyuz 37/Soyuz 36/Salyut 6 mission.

Vladimir Remek; Colonel, Czechoslovak Air Force; born September 26, 1948, Ceske-Budejovice, Czechoslovakia.

Graduated from the Kosice Air Force College, became a pilot second class in an air unit of the Czechoslovak People's Army, went to the Soviet Union in 1972 to study at the Gagarin Air Force Academy, returned to Czechoslovakia as a military pilot, and was chosen as a candidate for cosmonaut training in 1976. He was cosmonaut researcher for Soyuz 28 Salyut 6, becoming the first non-American, non-Russian in space.

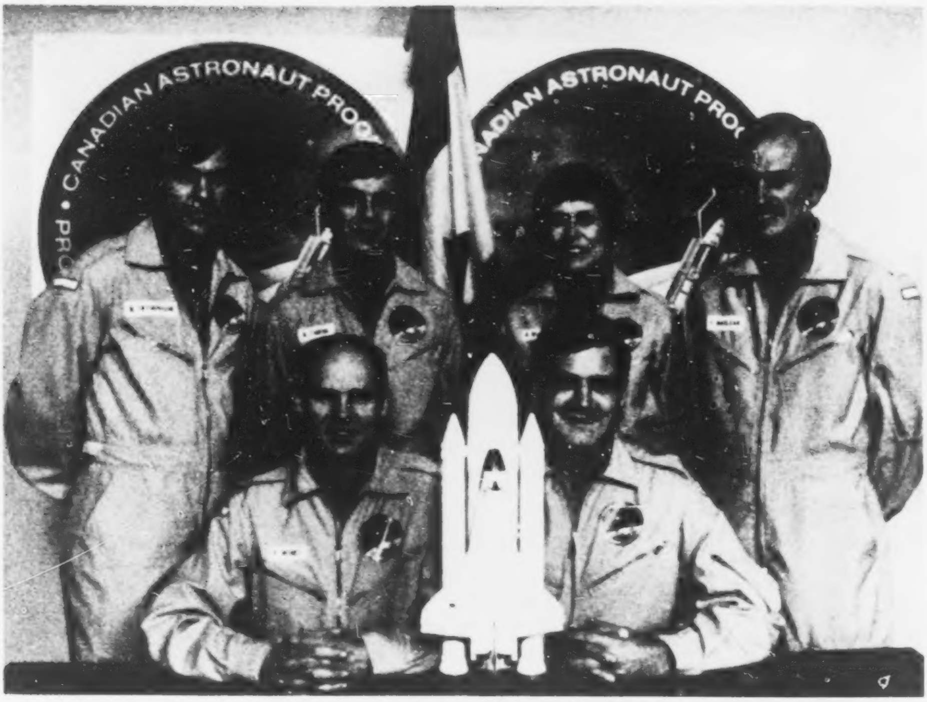
R SHARMA
Р ШАРМА

Rakesh Sharma; Indian Air Force; born January 13, 1949, Patiala, India; married, two children.

Graduated from the Military Academy and, in 1966, entered the National Defense Academy. Following graduation, he entered the Indian Air Force. In 1982, Sharma began training at the Gagarin Cosmonaut Training center and he flew on Soyuz T-11, becoming the first Indian cosmonaut.

Arnaldo Tamayo-Mendez; Colonel, Cuban Air Force; born January 29, 1942, Guantanamo, Cuba.

Joined aviation school, served in Cuba's revolutionary armed forces, went to Gagarin Cosmonaut Training Center in 1978. He was cosmonaut researcher for Soyuz 38/Salyut 6.


CANADIAN ASTRONAUT PROG
ADIAN ASTRONAUT PRO

Robert Brent Thirsk; (second row, second from left) Canada.

He was a physician at Queen Elizabeth Hospital in 1983. Dr. Thirsk was one of six Canadian astronauts selected in 1983, and served as backup for STS 41-G.

CANADIAN ASTRONAUT PRO
PRO
ADIAN ASTRONAUT PRO

Bjarni B. Tryggvason; (second row, left) Canada.

He was an associate research officer with the Canadian National Research Council when selected as one of six Canadian astronauts.

Nigel Wood; United Kingdom.

Wood was selected to be the first British astronaut and is assigned to the 1986 shuttle mission which will launch Skynet 4.

TABLE 5-1

SUMMARY TABLE OF SPACENAUTS

Name	Country	Launching Country	Flights	Comments
Al-Basam	Saudi Arabia	US	none	Backup for Al-Saud.
Alexandrov	Bulgaria	USSR	none	Backup for Ivanov.
Al-Saud	Saudi Arabia	US	STS 51-G	First Saudi in space.
Baudry	France	US	STS 51-G	Backup for Chretien. Flew as payload specialist on STS 51-G.
Bondar	Canada	US	pending	In training.
Boyle	United Kingdom	US	none	Resigned.
Bui	Vietnam	USSR	none	Backup for Pham Tuan. Died in a plane crash in 1981.
Chretien	France	USSR	Soyuz T-6/T-7	First Frenchman in space.
Dediu	Romania	USSR	none	Backup for Prunariu.
Farkas	Hungaria	USSR	Soyuz 36/35	First Hungarian in space.
Farrimond	United Kingdom	US	pending	In training.
Furrer	West Germany	US	pending	In training.
Ganzorig	Mongolia	USSR	none	Backup for Gurragcha.
Garneau	Canada	US	STS 41-G	First Canadian in space.
Gurragcha	Mongolia	USSR	Soyuz 39	First Mongolian in space.
Hermaszewski	Poland	USSR	Soyuz 30	First Pole in space.

CHAPTER SIX

COMPARATIVE DATA ON AMERICAN AND SOVIET SPACEFLIGHTS

Table 6–1 compares the manned spaceflights of the United States and the Soviet Union. The table is set up in chronological order with the name of the spacecraft in the left column together with its popular label or call sign, if any. The next columns give the launch date, the crew, extravehicular activity (in space or on the lunar surface) if any, the duration of the mission, the national cumulative person-hours, and any salient comments. Figures for national cumulative person-hours are compiled by taking the cumulative person-hours through the previous flight of the same country and adding the additional person-hours of the new flight. If there was more than one person on the flight, the flight time is multiplied by the number of people to obtain the person-hours figure.

Table 6–2 lists the prime and backup crews of the various manned spaceflights by program. Note that the United States no longer names backup crews for shuttle flights.

Table 6–3 lists the hours spent in space flight (other than the X-15) by each astronaut, cosmonaut, or spacenaut.

Table 6–4 lists the hours spent performing extravehicular activity (EVA) either in space or on the lunar surface by each astronaut, cosmonaut, or spacenaut.

Table 6–5 compares the various manned flight programs by number of flights, number of people, and person-hours.

Table 6–6 lists the astronauts and cosmonauts who have died either in their program or after leaving it, date, and cause of death.

TABLE 5-1 (cont.)

Name	Country	Launching Country	Flights	Comments
Holmes	United Kingdom	US	pending	In training.
Ivanov	Bulgaria	USSR	Soyuz 33	First Bulgarian in space.
Jahn	East Germany	USSR	Soyuz 31/29	First East German in space.
Jankowski	Poland	USSR	none	Backup for Hermaszewski.
Kollner	East Germany	USSR	none	Backup for Jahn.
Longhurst	United Kingdom	US	pending	In training.
Lopez-Falcon	Cuba	USSR	none	Backup for Tamayo-Mendez.
Maclean	Canada	US	pending	In training.
Magyari	Hungary	USSR	none	Backup for Farkas.
Malhoutra	India	USSR	none	Backup for Sharma.
Merbold	West Germany	US	STS-9	Flew as a payload specialist for the European Space Agency on Spacelab 1 (STS-9).
Messerschmid	West Germany	US	pending	In training.
Money	Canada	US	pending	In training.
Nicollier	Switzerland	US	pending	Completed one year of training at NASA's Johnson Space Center under the auspices of the European Space Agency.

TABLE 5-1 (cont.)

Name	Nationality	Launching Country	Flights	Comments
Ockels	Netherlands	US	pending	Backup for Merbold on Spacelab 1 and will be a prime crew member on Spacelab D-1, STS 61-A.
Pelcak	Czechoslovakia	USSR	none	Backup for Remek.
Prunariu	Romania	USSR	Soyuz 40	First Romanian in space.
Pham Tuan	Vietnam	USSR	Soyuz 37/36	First Vietnamese in space.
Remek	Czechoslovakia	USSR	Soyuz 28	First Czech in space. First non-American, non-Russian in space.
Sharma	India	USSR	Soyuz T-11/ Salyut 7	First Indian in space.
Tamayo-Mendez	Cuba	USSR	Soyuz 38	First Cuban in space.
Thirsk	Canada	US	none	Backup for Garneau.
Tryggvason	Canada	US	pending	In training.
Wood	United Kingdom	US	pending	In training.

TABLE 6-1

U.S. AND U.S.S.R. MANNED SPACEFLIGHTS

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/ Space	Lunar	Mission Duration	National Cumulative Person-Hours c/	Comments
Vostok 1 Kedr (Cedar)	04/12/61	Gagarin	none	none	1:48	1:48	First manned space flight. Completed one orbit.
Freedom 7 Mercury-Redstone 3	05/05/61	Shepard	none	none	:15	:15	First U.S. manned space flight, although flight was suborbital.
Liberty Bell 7 Mercury-Redstone 4	07/21/61	Grissom	none	none	:16	:31	Suborbital flight. Capsule sank after landing.
Vostok 2 Oryel (Eagle)	08/06/61	Titov	none	none	25:18	27:06	First spaceflight exceeding 24 hours.
Friendship 7 Mercury-Atlas 6	02/20/62	Glenn	none	none	4:55	5:26	First U.S. orbital space flight. Completed 3 orbits.
Aurora 7 Mercury-Atlas 7	05/24/62	Carpenter	none	none	4:56	10:22	Completed 3 orbits.
Vostok 3 Sokol (Falcon)	08/11/62	Nikolayev	none	none	94:25	121:31	First dual space mission (with Vostok 4).
Vostok 4 Berkut (Golden Eagle)	08/12/62	Popovich	none	none	70:59	192:30	First dual space mission (with Vostok 3). Two spacecraft passed 6.5 km from each other.
Sigma 7 Mercury-Atlas 8	10/03/62	Schirra	none	none	9:13	19:35	Completed 6 orbits.
Faith 7 Mercury-Atlas 9	05/15/63	Cooper	none	none	34:20	53:55	First U.S. flight to exceed 24 hours.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Vostok 5 Yastreb (Hawk)	06/14/63	Bykovski	none	none	119:06	311:36	Second dual mission (with Vostok 6).
Vostok 6 Chayka (Sea Gull)	06/16/63	Tereshkova	none	none	70:50	382:26	First woman in space. Second dual mission (with Vostok 5).
Voskhod 1 Rubin (Ruby)	10/12/64	Komarov Yegorov Feoktistov	none	none	24:17	455:17	First three-man crew.
Voskhod 2 Almaz (Diamond)	03/18/65	Bel'yayev Leonov	0:24	none	26:02	507:21	First extravehicular activity; completed by Leonov.
Gemini 3 Molly Brown	03/23/65	Grissom (2) Young	none	none	4:53	63:41	First U.S. two-man crew. Performed first manual spacecraft maneuvers in space.
Gemini 4	06/03/65	McDivitt White	0:36	none	97:56	259:33	First U.S. extravehicular activity, performed by White.
Gemini 5	08/21/65	Cooper (2) Conrad	none	none	190:55	641:23	Stayed in orbit for 8 days to demonstrate feasibility of long-duration manned space flight.
Gemini 7	12/04/65	Borman Lovell	none	none	330:35	1302:23	First U.S. space rendezvous (with Gemini 6).
Gemini 6	12/15/65	Schirra (2) Stafford	none	none	25:51	1354:15	Rendezvoused within 30 cm of Gemini 7.
Gemini 8	03/16/66	Armstrong Scott	none	none	10:41	1375:37	First manned docking of two ships in orbit (with unmanned Agena 8 target). Malfunction forced early mission termination.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Gemini 9	06/03/66	Stafford (2) Cernan	2:07	none	72:21	1520:19	Performed three rendezvous with Agena 9 target, but could not dock because its shroud failed to jettison. Cernan performed one EVA.
Gemini 10	07/18/66	Young (2) Collins	1:27	none	70:47	1661:53	Docked with Agena 10 target vehicle and rendezvoused with Agena 8 target vehicle During a 38-minute umbilical EVA, Collins retrieved an experiment from the Agena He also performed a 49-minute stand-up EVA.
Gemini 11	09/12/66	Conrad (2) Gordon	2:41	none	71:17	1804:27	Docked with Agena 11 target vehicle four times; also performed first tethered flight Gordon performed one stand-up EVA (2 hrs 8 min) and one umbilical EVA (33 min).
Gemini 12	11/11/66	Lovell (2) Aldrin	5:30	none	94:35	1993:37	Gemini docked with Agena target vehicle 3 times. Unable to do high excursion flight because of Agena engine malfunction. Aldrin accrued record amount of EVA time durin two stand-up EVAs (2 hrs 2 min, 55 min) and one umbilical EVA (2 hrs 6 min).

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Apollo 204 (Apollo 1)	01/27/67	Grissom (3) White (2) Chaffee	--	--	--	--	Not a space flight, but date of fatal fire on pad during testing. All three astronauts were asphyxiated. Capsule was damaged, but the launch vehicle was unharmed and later flew unmanned as Apollo 5.
Soyuz 1 Rubin (Ruby)	04/23/67	Komarov (2)	none	none	26:37	533:58	Komarov was killed on impact with the Earth when the craft's parachute lines tangled during descent.
Apollo 7	10/11/68	Schirra (3) Eisele Cunningham	none	none	260:09	2774:04	First U.S. three-man mission. Tested Apollo command module.
Soyuz 3 Argon (Argon)	10/26/68	Beregovoi	none	none	94:51	628:49	Rendezvoused with unmanned Soyuz 2.
Apollo 8	12/21/68	Borman (2) Lovell (3) Anders	none	none	147:01	3215:07	First manned circumlunar flight (accomplished 10 lunar orbits). First manned flight of the Saturn V launch vehicle
Soyuz 4 Amur	01/14/69	Shatalov	2:00	none	71:23	795:50	Rendezvoused and docked with Soyuz 5. Two crew members from Soyuz 5 transferred to Soyuz 4 while in space (each accruing one hour of EVA time)
Soyuz 5 Baikal	01/15/69	Volynov Khrunov Yeliseyev	none	none	72:56	868:46	Khrunov and Yeliseyev transferred to Soyuz 4 while the two ships were docked (see above).

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/ Space	EVA b/ c/ Lunar	Mission Duration c/	National Cumulative Person-Hours c/	Comments
Apollo 9 Gumdrop and Spider	03/03/69	McDivitt (2) Scott (2) Schweickart	2:08	none	241:01	3938:10	Test of complete Apollo hardware, including docking of command and lunar modules. Schweickart performed EVA from the LM for 1 hr 7 min, while Scott performed EVA from CM for 1 hr 1 min.
Apollo 10 Charlie Brown and Snoopy	05/18/69	Stafford (3) Young (3) Cernan (2)	none	none	192:03	4514:19	Test of complete Apollo hardware (including docking systems) in lunar orbit.
Apollo 11 Columbia and Eagle	07/16/69	Armstrong (2) Collins (2) Aldrin (2)	none	05:36	195:19	5100:16	First manned landing on the Moon. During a 2 hr 48 min lunar EVA, Armstrong and Aldrin collected 21 kg of lunar material from their landing site in the Sea of Tranquility. All three astronauts returned safely to Earth.
Soyuz 6 Antey (Antaeus)	10/11/69	Shonin Kubasov	none	none	118:42	1106:10	Rendezvoused in space with Soyuz 7 and 8. Conducted welding experiments.
Soyuz 7 Buran (Snowstorm)	10/12/69	Filipchenko Volkov Gorbatko	none	none	118:41	1462:13	Rendezvoused with Soyuz 6 and 8. Performed earth resources survey work.
Soyuz 8 (Granit) Granite	10/13/69	Shatalov (2) Yeliseyev (2)	none	none	118:50	1699:53	Rendezvoused with Soyuz 6 and 7 (all performed group flight). Performed Earth resources survey work.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA a/ b/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Apollo 12 Yankee Clipper and Intrepid	11/14/69	Conrad (3) Gordon (2) Bean	none	15:32	244:36	5834:04	Second manned lunar landing; in Ocean of Storms. During 2 lunar EVAs (4 hrs 0 min, 3 hrs 46 min), Conrad and Bean collected 34.3 kg of lunar material.
Apollo 13 Odyssey and Aquarius	04/11/70	Lovell (4) Swigert Haise	none	none	142:55	6262:49	Explosion in the service module oxygen tank during trans-lunar flight caused mission (planned to be third lunar landing) to be aborted. Three astronauts recovered safely.
Soyuz 9 Sokol (Falcon)	06/01/70	Nikolayev (2) Sevast'yanov	none	none	424:59	2549:51	Set a new space duration record of 17 days, 17 hours while performing biomedical experiments.
Apollo 14 Kitty Hawk and Ancares	01/31/71	Shepard (2) Roosa Mitchell	none	18:46	216:02	6910:55	Third manned lunar landing. During 2 EVAs (4 hrs 48 min, 4 hrs 35 min) in the Fra Mauro area, Shepard and Mitchell collected 42.8 kg of lunar material.
Salyut 1	04/19/71	--	--	--	--	--	Unmanned docking target (space station) for Soyuz 10 and 11.
Soyuz 10 Granit (Granite)	04/22/71	Shatalov (3) Yeliseyev (3) Rukavishnikov	none	none	47:46	2693:09	Docked with Salyut 1, but were unable to enter due to hatch malfunction.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Soyuz 11 Yantar (Amber)	06/06/71	Dobrovolski Patsayev Volkov (2)	none	none	570:22	4404:15	Docked with Salyut 1, entered and conducted experiments for 23 days 18 hrs. Three cosmonauts killed during reentry when an improperly sealed hatch allowed all the air to escape from the capsule (cosmonauts did not have pressure suits).
Apollo 15 Endeavour and Falcon	07/26/71	Scott (3) Worden Irwin	1:16	37:43	295:12	7796:31	Fourth manned landing on the Moon, in the Hadley Appennin region. First use of the lunar rover, and first live TV coverage of LM lift-off. Scott and Irwin collected 76.7 kg of lunar material during 3 EVAs (6 hrs 33 min, 7 hrs 12 min, 4 hrs 50 min). In addition, Scott did a 33-min stand-up EVA from the LM. During flight back to Earth, Worden and Irwin performed a 38-min EVA.
Apollo 16 Casper and Orion	04/16/72	Young (4) Mattingly Duke	2:48	40:28	265:51	8594:04	Fifth manned lunar landing; in Descartes area. During 3 EVAs (7 hrs 11 min, 7 hrs 23 min, and 5 hrs 40 min) Young and Duke collected 94.3 kg of lunar material. During flight back to Earth, Mattingly and Duke performed a 1 hr 24 min EVA.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Apollo 17 America and Challenger	12/07/72	Cernan (3) Evans Schmitt	2:12	44:08	301:52	9499:40	Sixth manned lunar landing; in the Taurus-Littrow area. During 3 EVAs (7 hrs 12 min, 7 hrs 37 min, 7 hrs 15 min) Cernan and Schmitt collected 110.4 kg of lunar material. During trip back to Earth, Evans and Schmitt performed a 1 hr 6 min EVA.
Skylab 1	05/14/73	--	--	--	--	--	Unmanned docking target (space station) for three manned space flights.
Skylab 2	05/25/73	Conrad (4) Weitz Kerwin	10:33	none	672:50	11518:10	Performed repairs to the Skylab Workshop (Skylab 1) and occupied the workshop for 28 days. Completed 1 stand-up EVA (Weitz, 35 min) and 2 umbilical EVAs (Conrad and Kerwin, 3 hrs 23 min; Conrad and Weitz, 1 hr 36 min).
Skylab 3	07/28/73	Bean (2) Lousma Garriott	27:24	none	1472:09	15799:37	Second crew to occupy Skylab workshop; remained in orbit for 59 days. Completed 3 umbilical EVAs (Garriott and Lousma, 6 hrs 31 min; Carriott and Lousma 4 hrs 30 min; Garriott and Bean, 2 hrs 41 min).
Soyuz 12 Ural (Urals)	09/27/73	Lazarev Makarov	none	none	47:16	4498:47	Systems check of Soyuz capsule First manned flight since Soyuz 11 tragedy in 1971.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Skylab 4	11/16/73	Carr Pogue Gibson	44:50	none	2017:16	21851:25	Third crew to occupy Skylab workshop; remained in orbit for 84 days. Completed 4 umbilical EVAs (Gibson and Pogue, 6 hrs 34 min; Carr and Pogue, 7 hrs 3 min; Gibson and Carr, 3 hrs 29 min, and 5 hrs 19 min).
Soyuz 13 Kavkaz (Caucasus)	12/18/73	Klimuk Lebedev	none	none	188:55	4876:37	Performed astrophysical, biological and earth resources experiments.
Salyut 3	06/24/74	--	--	--	--	--	Unmanned docking target (space station) for Soyuz 14 and 15.
Soyuz 14 Berkut (Golden Eagle)	07/03/74	Popovich (2) Artyukhin	none	none	377:30	5631:37	Occupied Salyut 3; performed earth resources work.
Soyuz 15 Danay (Danube)	08/26/74	Sarafanov Demin	none	none	48:12	5727:31	Attempted to dock with Salyut 3, but was unsuccessful.
Soyuz 16 Buran (Snowstorm)	12/02/74	Filipchenko (2) Rukavishnikov (2)	none	none	142:24	6012:49	Precursor flight for ASTP (see below) to check modified Soyuz systems.
Salyut 4	12/26/74	--	--	--	--	--	Unmanned docking target (space station) for manned Soyuz 17 and 18 flights, as well as the unmanned Soyuz 20.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Soyuz 17 Zenit (Zenith)	01/10/75	Grechko Gubarev	none	none	709:20	7431:29	Occupied Salyut 4, setting a Soviet duration record of 30 days.
April 5 Anomaly Ural (Urals)	04/05/75	Lazarev (2) Makarov (2)	none	none	:20	7432:09	Mission aborted before reaching orbit due to 3rd stage malfunction. Intended to dock with Salyut 4. If successful, it would have been designated Soyuz 18.
Soyuz 18 Kavkaz (Caucasus)	05/24/75	Klimuk (2) Sevast'yanov (2)	none	none	1511:20	10454:49	Occupied Salyut 4 for 63 days.
Soyuz 19 Soyuz (Union)	07/15/75	Leonov (2) Kubasov (2)	none	none	142:31	10739:5[illegible]	First docking of two spacecraft from differing nations (with U.S. Apollo). Conducted joint experiments.
Apollo-Soyuz Test Project (ASTP)	07/15/75	Stafford (4) Brand Slayton	none	none	217:28	22503:49	Docked with Soviet Soyuz 19 for first international docking in space. Conducted joint experiments.
Salyut 5	06/22/76	--	--	--	--	--	Unmanned docking target (space station) for Soyuz 21, 23, and 24.
Soyuz 21 Baikal	07/06/76	Volynov (2) Zholobov	none	none	1182:24	13104:39	Docked with Salyut 5 for 49 days. Performed earth resources work, and experiments with space processing.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Soyuz 22 Yastreb (Hawk)	09/15/76	Bykovskiy (2) Aksenov	none	none	189:54	13484:27	Took earth resources photographs with East German 6-channel multispectral camera. First time foreign equipment was flown on a Soviet manned flight.
Soyuz 23 Radon	10/14/76	Zudov Rozhdestvenski	none	none	48:06	13580:39	Unsuccessful attempt to dock with Salyut 5.
Soyuz 24 Terek	02/07/77	Gorbatko (2) Glazkov	none	none	425:23	14431:25	Docked with Salyut 5 for 18 days of experiments similar to those of Soyuz 21.
Salyut 6	09/29/77	--	--	--	--	--	Unmanned docking target (space station). Has two docking ports, allowing either resupply craft or two manned crews to occupy the station at the same time.
Soyuz 25 Foton	10/09/77	Kovalenok Ryumin	none	none	48:46	14528:57	Unsuccessful docking attempt with Salyut 6.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Soyuz 26 Tamyr	12/10/77	Romanenko Grechko (2)	1:28	none	898:06	16325:09	Docked with Salyut 6; Romanenko and Grecnko established a new space endurance record (96 days, 10 hours). While aboard Salyut 6, three other missions docked at the space station's other docking port: Soyuz 27, Progress 1 (unmanned), and Soyuz 28. The Soyuz 27 crew returned to Earth in the Soyuz 26 ship on January 16, resulting in the mission duration time given here. Romanenko and Grechko returned to Earth on March 16 in the Soyuz 27 ship. On Dec. 20, Grechko performed EVA.
Soyuz 27 Pamyr	01/10/78	Dzhanibekov Makarov (3)	none	none	1558:53	19442:55	Docked with Salyut 6 while Soyuz 26 crew was onboard. Returned in the Soyuz 26 ship on January 16, resulting in the mission duration time given here. The crew duration was 142 hours and 59 minutes.
Progress 1	01/20/78	--	--	--	--	--	Unmanned resupply ship for Salyut 6. First resupply mission; included transfer of fuel.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Soyuz 28 Zenit	03/02/78	Gubarev (2) Remek	none	none	190:17	19823:29	Docked with Salyut 6 while Romanenko and Grechko were still onboard. Remek was first non-American, non-Russian person in space (he is Czechoslovakian).
Soyuz 29 Foton	06/15/78	Kovalyonok (2) Ivanchenkov	4:10	none	1911:23	23646:15	Docked with Salyut 6. Crew established new duration record of 139 days 15 hours (3350 hours 48 minutes). Performed 2 hour 5 minute EVA on July 29. Soyuz 29 spacecraft returned on Sept. 3 with Soyuz 31 crew. Soyuz 29 crew returned in Soyuz 31 spacecraft on Nov. 2.
Soyuz 30 Kavkaz	06/27/78	Klimuk (3) Hermaszewski	none	none	190:04	24026:23	Docked with Salyut 6 while Kovalenok and Ivanchenkov on board. Hermaszewski was first Polish cosmonaut.
Progress 2	07/07/78	--	--	--	--	--	Unmanned resupply ship for Salyut 6.
Progress 3	08/08/78	--	--	--	--	--	Unmanned resupply ship for Salyut 6.
Soyuz 31 Yastreb	08/26/78	Bykovski (3) Jahn	none	none	1628:14	27282:51	Crew duration was 188 hours 49 minutes. Returned in Soyuz 29 ship on Sept. 3. Jahn was first East German cosmonaut.
Progress 4	10/04/78	--	--	--	--	--	Unmanned resupply ship for Salyut 6.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Soyuz 32 Proton	02/25/79	Lyakhov Ryumin (2)	02:46	none	4200:36 d/	35684:03	Crew set new duration record of 175 days. Docked with Salyut 6 and made repairs. Performed 1 hour 23 minutes EVA on Aug. 15 to free KRT-10 radio telescope. Soyuz 32 reentered (unmanned) on June 13 after 2586 hours 24 minutes duration. Crew returned in Soyuz 34 on Aug. 19.
Progress 5	03/12/79	--	--	--	--	--	Unmanned resupply ship for Salyut 6.
Soyuz 33 Saturn	04/10/79	Rukavishnikov Ivanov	none	none	47:01	35778:05	Engine failure just prior to planned docking with Salyut 6 forced early mission termination. Ivanov first Bulgarian cosmonaut.
Progress 6	05/13/79	--	--	--	--	--	Unmanned resupply craft for Salyut 6.
Soyuz 34	06/ 06/79	--	--	--	d/	--	Unmanned replacement ship for Soyuz 32. Ship's duration was 1770 hours 17 minutes, landing on Aug. 19.
Progress 7	06/28/79	--	--	--	--	--	Unmanned resupply craft for Salyut 6.
Soyuz T	12/16/79	--	--	--	--	--	Improved version of Soyuz spacecraft. Systems test.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Progress 8	03/27/80	--	--	--	--	--	Unmanned resupply ship for Salyut 6.
Soyuz 35 Dneiper	04/09/80	Popov Ryumin (3)	--	--	1321:29	38421:03	Crew set new duration record of 185 days (4436 days 12 hours). Ryumin is veteran of 175 day Soyuz 32 mission. Popov and Ryumin returned in Soyuz 37 spaceship on Oct. 11. Soyuz 35 ship returned on June 3.
Progress 9	04/27/80	--	--	--	--	--	Unmanned resupply ship for Salyut 6.
Soyuz 36 Orion	05/26/80	Kubasov (3) Farkas	--	--	1580:54	41582:51	Crew duration was 188 hours 46 minutes. Returned in Soyuz 35 spacecraft on June 3. Docked with Salyut 6 while Ryumin and Popov on board. Farkas was first Hungarian cosmonaut. Soyuz 36 ship returned with Soyuz 37 crew on July 31.
Soyuz T-2 Jupiter	06/05/80	Malyshev Aksenov (2)	--	--	94:21	41771:33	First manned flight of the improved Soyuz T spacecraft. Docked with Salyut 6 while Popov and Ryumin were on board.
Progress 10	06/29/80	--	--	--	--	--	Unmanned resupply ship for Salyut 6.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights)	EVA b/ Space	c/ Lunar	Mission Duration c/	National Cumulative Person-Hours c/	Comments
Soyuz 37 Terek	07/23/80	Gorbatko (3) Pham Tuan	--	--	1911:17	45594:07	Crew duration was 188 hours 42 minutes. Returned in Soyuz 36 ship on July 31. Docked with Salyut 6 while Popov and Ryumin on board. Soyuz 37 returned with Soyuz 35 crew on Oct. 11. Pham Tuan first Vietnamese cosmonaut.
Soyuz 38 Taymyr	09/18/80	Romanenko (2) Tamayo-Mendez	--	--	188:43	45971:33	Docked with Salyut 6 while Popov and Ryumin on board. Tamayo-Mendez first Cuban cosmonaut.
Progress 11	09/28/80	--	--	--	--	--	Unmanned resupply ship for Salyut 6.
Soyuz T-3 Mayak	11/27/80	Kizim Makarov (4) Strekalov	--	--	307:08	46892:57	First three-man crew since Soyuz 11. Docked with Salyut 6.
Progress 12	01/24/81	--	--	--	--	--	Unmanned resupply ship for Salyut 6.
Soyuz T-4	03/12/81	Kovalenok (3) Savinykh	--	--	1794:38	50482:13	Docked with Salyut 6. Conducted experiments for 75 days.
Soyuz 39	03/22/81	Dzhanibekov (2) Gurragcha	--	--	186:43	47266:23	Docked with Salyut 6 while Kovalenok and Savinykh on board. Gurragcha was first Mongolian cosmonaut.

TABLE 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
STS-1 Columbia	04/12/81	Young (5) Crippen	--	--	54:21	22612:31	First U.S. manned flight in 6 years. First orbital flight of the space shuttle. Flight proceeded without difficulty following two-day launch delay because of computer problems.
Soyuz 40	05/14/81	Popov (2) Prunariu	--	--	188:41	51233:01	Docked with Salyut 6 while Kovalenok and Savinykh on board. Prunariu first Romanian cosmonaut.
STS-2 Columbia	11/12/81	Engle Truly	--	--	54:13	22720:57	Second orbital test flight of shuttle (first flight of "used" spacecraft). Mission terminated early because of failure of one fuel cell (had been planned for 124 hours).
STS-3 Columbia	03/22/82	Lousma (2) Fullerton	--	--	192:05	23105:07	Third test flight of the shuttle. Launched one hour late; landed one day late because of bad weather at landing site (White Sands was used due to water on the lakebed at Edwards).
Salyut 7	04/19/82	--	--	--	--	--	Unmanned space station.

Table 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights	EVA b/ Space	c/ Lunar	Mission Duration c/	National Cumulative Person-Hours c/	Comments
Soyuz T-5 (Elbrus)	05/13/82	Berezovoy Lebedev (2)	2:33	--	2549:06	61379:11	Ship returned with Soyuz T-7 crew. Soyuz T-5 crew duration was new record -- 211 days. Both performed 2 h 33 min EVA on Aug. 2. Landed in a blizzard.
Progress 13	05/23/82	--	--	--	--	--	Unmanned resupply ship.
Soyuz T-6 (Pamir)	06/24/82	Dzhanibekov (3) Ivanchenkov (2) Chretien	--	--	189:51	61948:44	Carried first French "spationaut." Docked with Salyut 7 and Soyuz T-5.
STS-4 (Columbia)	06/27/82	Mattingly (2) Hartsfield	--	--	169:10	23443:27	Fourth and last test flight of the shuttle; carried first DOD payload (CIRRIS experiment) which did not work correctly. First landing on hard pavement. Both SRBs lost at sea.
Progress 14	07/10/82	--	--	--	--	--	Unmanned resupply ship.
Soyuz T-7 (Dneip)	08/19/82	Popov (3) Serebrov Savitskaya	--	--	2712:51	62518:20	Docked with Salyut 7 and Soyuz T-5 (returned in T-5). Savitskaya second woman cosmonaut. Crew duration was 189:52.
Progress 15	09/17/82	--	--	--	--	--	Unmanned resupply ship.
Progress 16	10/31/82	--	--	--	--	--	Unmanned resupply ship.

Table 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
STS-5 (Columbia)	11/11/82	Brand (2) Overmyer Allen Lenoir	--	--	122:14	23932:23	First operational flight of the shuttle--deployed two commercial communication satellites (SBS-3 and Telesat). First four-man crew. Had planned for Allen and Lenoir to perform EVA, but both EVA suits failed.
STS-6 Challenger	04/04/83	Weitz (2) Bobko Musgrave Peterson	7:44	--	120:24	24413:59	First flight of Challenger. Deployed first TDRS. Musgrave and Peterson performed 3 hr 52 min EVA in cargo bay. Landed at Edwards. Unsuccessful attempt to dock with Salyut 7/Kosmos 1443. Rendevous radar did not deploy.
Soyuz T-8 (Okean)	04/20/83	Titov, V. Strekalov (2) Serebrov (2)	--	--	48:18	62667:11	Unsucessful attempt to dock with Salyut 7/Kosmos 1443. Rendezvous radar did not deploy.
STS-7 Challenger	06/18/83	Crippen (2) Hauck Ride Fabian Thagard	--	--	146:24	25146:01	First U.S. woman (Ride) in space. First 5-person crew. Deployed Palapa and Anik comsats Deployed and retrieved German SPAS. Weather forced landing at Edwards instead of KSC.
Soyuz T-9 (Proton)	06/27/83	Lyakhov (2) Alexandrov	11:50	--	3585:46	69838:43	Docked with Salyut 7/K 1443. After failure of Soyuz T-10, performed 2 EVAs (Nov. 1 for 2 hrs 50 min; Nov. 3 for 2 hrs 55 min) to install additional solar panels increasing electrical supply by 50%. First time cosmonauts done 2 EVAs on one mission.

Table 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
Progress 17	08/17/83	---	---	---	---	---	Unmanned resupply ship.
STS-8	08/30/83	Truly (2) Brandenstein Thornton Bluford Gardner, D.	---	---	145:09	25871:44	First night launch, and night landing, of shuttle. First American black in space (Bluford). Thornton oldest (54) to fly. Launch delayed 17 min. due to bad weather. Deployed INSAT 1B; flew postal covers.
(Soyuz T-10)	09/26/83	Titov, V. (2) Strekalov (3)	---	---	---	---	Fire in launch vehicle forced use of emergency abort system; crew safely recovered. Were to dock with Salyut 7, possibly as first replacement crew.
Progress 18	10/20/83	---	---	---	---	---	Unmanned resupply ship.
STS-9 Columbia	11/28/83	Young (6) Shaw Parker Garriott (2) Lichtenberg Merbold (ESA)	---	---	247:47	27358:26	First Spacelab flight. First non-American (Merbold) to fly on American mission. First six person crew. First payload specialists (Lichtenberg, Merbold). First 10-day shuttle flight. Landing at Edwards delayed 8 hours due to computer malfunction.
STS 41-B Challenger	02/03/84	Brand (3) Gibson, R. McCandless McNair Stewart	23:00	---	191:16	28314:46	McCandless and Stewart performed first untethered EVAs on Feb. 7 and 9. Two satellites (Westar and Palapa) were deployed from shuttle, but upper stage did not

Table 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
							function properly and satellites left in unusable orbit. Balloon to be used for rendevous experiments exploded on inflation. First shuttle to land at KSC, Florida. EVAs were 5.5 & 6 hrs.
Soyuz T-10	02/08/84	Kizim (2) Solovyev Atkov	45:40	---	1510:43	74370:52	Docked with Salyut 7. Ship returned with T-11 crew. Crew set new duration record (239 days). Performed six EVAs (Kizim and Solovyov), setting new EVA record as well.
Soyuz T-11 (Jupiter)	04/03/84	Malyshev (2) Strekalov (3) Sharma (India)	---	---	4365:48	87468:16	Docked with Salyut 7 and Soyuz T-10; returned in T-10 ship. Sharma first Indian cosmonaut.
STS-41 C Challenger	04/06/84	Crippen (3) Scobee Hart van Hoften Nelson	21:00	---	167:40	29153:06	Deployed LDEF; retrieved and repaired and redeployed Solar Max satellite. Nelson and van Hoften performed 2 EVAs (Apr. 8 for 4 hrs; Apr. 11 for 6.5 hrs). Landed at Edwards instead of KSC due to inclement weather in Florida.
Soyuz T-12 (Pamir)	07/17/84	Dzhanibekov (4) Savitskaya (2) Volk	7:10		283:14 (12 days)	88317:58	Docked with Salyut 7 and Soyuz T-10/T-11 crew. Savitskaya first woman to perform EVA (with Dzhanibekov) for 3 hrs 35 min on 7/25.

Table 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
STS 41 D Discovery	08/30/84	Hartsfield (2) Coats Resnik Hawley Mullane Walker	none	---	144:57	30022:48	Deployed 3 communication satellites; worked with solar panel. First flight of Discovery; Resnik 2nd American woman in space; Walker first industrial payload specialist.
STS 41 G Challenger	10/05/84	Crippen (4) McBride Ride (2) Sullivan Leestma Garneau (Canada) Scully-Power	7:00	---	197:24	31404:36	Sullivan first U.S. woman to do EVA on Oct. 11 with Leestma (3 hr 30 min). Garneau first Canadian astronaut. Scully-Power, payload specialist. First U.S. in-space fuel transfer; worked with SIR-B; deployed ERBBS.
STS 51 A Discovery	11/08/84	Hauck (2) Walker Allen (2) Fisher A. Gardner, D. (2)	23:08		191:45	32363:31	Allen and Gardner retrieved Palapa and Westar satellites placed in wrong orbit on STS 41 B. Performed 2 EVAs (5 hrs and 5 hrs 43 min) to do this. Fisher first U.S. mother in space. Deployed two other communications satellites. Landed at KSC. Launch had been delayed by 1 day due to weather.

Table 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
STS 51 C Dicsovery	01/24/85	Mattingly (3) Shriver Onizuka Buchli Payton (DOD)	---	---	73:33 (3 days)	32731:06	First dedicated DOD shuttle flight. First DOD payload specialist. Deployed what was stated in the media to be a SIGINT satellite. Launch delayed 1 day by weather.
STS 51 D Discovery	04/12/85	Bobko (2) Williams Hoffman Griggs Seddon C. Walker (2) Garn	6:16	---	167:56 (7 days)	33906:38	Launch delayed about 45 min by weather. Garn first U.S. passenger in orbit. Deployed Leasat satellite which failed to initiate timing sequence. Crew attempt to revive it by hitting timing level failed (lever was hit, but nothing happened). Required unscheduled EVA by Hoffman and Griggs for 3 hours 8 min to attach "fly-swatters to end of RMS, which Seddon then used to hit the lever. Mission lasted two days longer than planned.
STS 51 B Challenger (Spacelab 3)	04/29/85	Overmyer (2) Gregory Thornton (2) Thagard (2) Lind Vandenberg Wang	---	---	168:03 (7 days)	35082:59	Spacelab 3 mission, including 2 squirrel monkeys and 24 rats. Major problems with cage which allowed food and waste to escape into Spacelab and shuttle cabin. Vandenberg and Wang were payload specialists.
Soyuz T-13	06/06/85	Dzhanibekov (5) Savinykh (2)	---	---			

Table 6-1 (cont.)

Mission (Call Sign)	Launch Date	Crew a/ (Number of Flights	EVA b/ c/		Mission Duration c/	National Cumulative Person-Hours c/	Comments
			Space	Lunar			
STS 51 G Discovery	06/17/85	Brandenstein (2) Creighton Lucid Nagel Fabian (2) Baudry (France) Salman Al-Saud (Saudi Arabia)	---	---	169:39	36270:32	First Saudi Arabian astronaut, second French spacenaut (but first to fly on U.S. ship); deployed three comsats: Morelos (Mexico), Arabsat, and Telstar. Deployed and retrieved first Spartan satellite.

a/ U.S. three-man crews are listed in the following order: Apollo--Commander, Command Module Pilot, Lunar Module Pilot; Skylab--Commander, Pilot, Science Pilot; ASTP--Commander, Command Module Pilot, Docking Module Pilot.

b/ EVA, or extravehicular activity, was measured in different ways for different U.S. space programs. During Gemini, the time was computed from hatch opening to hatch closing. For Apollo and Skylab, both space and lunar EVAs were computed from the time cabin pressure reached 3.0 psi during depressurization and repressurization. The inconsistency results from a change in NASA's definition of what constituted EVA for these missions. The times listed here represent the total time spent on EVA for all members of the crew during the flight. Details about the EVAs (including number, duration, and participants) is given in the "Comments" column. Total EVA times for individual astronauts are given in table 1-2 and for cosmonauts in table 4-2.

In the case of Voskhod 2 and Soyuz 4/5, no specific durations are announced for the EVA nor explanation of what criteria were used for computing the approximate times that were announced. Western sources computed their own figures for the time the cosmonauts were actually outside the spacecraft: 12 minutes for Leonov on Voskhod 2; 15 minutes each for Khrunov and Yeliseyev on Soyuz 4/5. Durations announced by the Soviet press are larger than these computations, and probably reflect times of hatch opening to hatch closing, so are used in this table, since they would therefore be most similar to the times used for U.S. EVAs. For Grechko on Soyuz 26, the Soviets announced that he spent 88 minutes in the "near vacuum conditions of space" (taken here to mean hatch opening to hatch closing) and 20 minutes actually outside the ship.

c/ All times are given in hours and minutes. For mission duration, times refer to ships, not crews. On several Soviet space missions, crews exchanged ships once they had docked with Salyut 6. For example, the Soyuz 26 crew returned to Earth in the Soyuz 27 ship, while the Soyuz 27 crew returned in the Soyuz 26 ship. This procedure was followed to provide a "fresh" Soyuz ferry craft for crews remaining on board Salyut for more than 90 days (Soyuz is rated for only 90 days of powered-down operation). In the case where ships were exchanged, crew times are provided under the "Comments" section.

d/ For Soyuz 32 and 34: Soyuz 34 was launched unmanned to replace the aging Soyuz 32, following the failure of the Soyuz 33 mission to dock with Salyut 6. Since Soyuz 32 was not commanded to reenter until Soyuz 34 was safely docked with the space station, the sum of the two ship's duration exceeds the crew duration. Soyuz 32 ship duration was 2596:24; Soyuz 34 ship duration was 1770:17. The duration for the crew, used here to compute "national cumulative person hours," was 4200:36.

TABLE 6-2a

U.S. MANNED SPACEFLIGHT CREW MEMBERS BY PROGRAM

MISSION	PRIME CREW			BACKUP CREW		
Mercury	Command Pilot			Command Pilot		
MR-3	Shepard			Glenn		
MR-4	Grissom			Glenn		
MA-6	Glenn			Carpenter		
MA-7	Carpenter			Schirra		
MA-8	Schirra			Cooper		
MA-9	Cooper			Shepard		
Gemini	Command Pilot	Pilot		Command Pilot	Pilot	
3	Grissom	Young		Schirra	Stafford	
4	McDivit	White		Borman	Lovell	
5	Cooper	Conrad		Armstrong	See	
7	Borman	Lovell		White	Collins	
6	Schirra	Stafford		Grissom	Young	
8	Armstrong	Scott		Conrad	Gordon	
9	Stafford	Cernan		Lovell	Aldrin	
10	Young	Collins		Bean	Williams	
11	Conrad	Gordon		Armstrong	Anders	
12	Lovell	Aldrin		Cooper	Cernan	
Apollo	Commander	Command Module Pilot	Lunar Module Pilot	Commander	Command Module Pilot	Lunar Module Pilot
204 a/	Grissom	White	Chaffee	Schirra	Eisele	Cunningham
7	Schirra	Eisele	Cunningham	Stafford	Young	Cernan
8	Borman	Lovell	Anders	Armstrong	Aldrin	Haise
9	McDivitt	Scott	Schweickart	Conrad	Gordon	Bean
10	Stafford	Young	Cernan	Cooper	Eisele	Mitchell
11	Armstrong	Collins	Aldrin	Lovell	Anders	Haise
12	Conrad	Gordon	Bean	Scott	Worden	Irwin
13	Lovell	Swigert b/	Haise	Young	Mattingly b/	Duke
14	Shepard	Roosa	Mitchell	Cernan	Evans	Engle
15	Scott	Worden	Irwin	Gordon	Brand	Schmitt
16	Young	Mattingly	Duke	Haise	Roosa	Mitchell
17	Cernan	Evans	Schmitt	Young	Roosa	Duke

TABLE 6-3

COMPARATIVE TIME SPENT ON SPACE MISSIONS

Name	Country	Number of Flights	Total (hrs:mins)
Ryumin	U.S.S.R.	3	8685:34
Lyakhov	U.S.S.R.	2	7786:22
Kizim	U.S.S.R.	2	5993:58
Atkov	U.S.S.R.	1	5686:50
Solovyov	U.S.S.R.	1	5686:50
Lebedev	U.S.S.R.	2	5262:00
Kovalenok	U.S.S.R.	3	5194:12
Berezovoy	U.S.S.R.	1	5073:05
Popov	U.S.S.R.	3	4814:55
Aleksandrov	U.S.S.R.	1	3585:46
Ivanchenkov	U.S.S.R.	2	3540:39
Grechko	U.S.S.R.	2	3023:20
Romanenko	U.S.S.R.	2	2502:43
Carr	U.S.	1	2017:16
Gibson, E.	U.S.	1	2017:16
Pogue	U.S.	1	2017:16
Sevest'yanov	U.S.S.R.	2	1936:19
Klimuk	U.S.S.R.	3	1890:19
Savinykh	U.S.S.R.	1	1794:38
Garriott	U.S.	2	1674:56
Bean	U.S.	2	1671:45
Lousma	U.S.	2	1619:14
Volynov	U.S.S.R.	2	1255:20
Zholobov	U.S.S.R.	1	1182:24
Conrad	U.S.	4	1179:38
Gubarev	U.S.S.R.	2	899:37
Young	U.S.	6	835:42
Dzhanibekov	U.S.S.R.	4	802:47
Weitz	U.S.	2	793:14
Gorbatko	U.S.S.R.	3	732:46
Lovell	U.S.	4	715:06
Volkov	U.S.S.R.	2	689:03
Kerwin	U.S.	1	672:50
Dobrovolskiy	U.S.S.R.	1	570:22
Patsayev	U.S.S.R.	1	570:22
Cernan	U.S.	3	566:16
Crippen	U.S.	4	565:49
Scott	U.S.	3	546:54
Brand	U.S.	3	530:58
Nikolayev	U.S.S.R.	2	519:24
Mattingly	U.S.	3	508:34
Stafford	U.S.	4	507:43
Bykovskiy	U.S.S.R.	3	497:49
Makarov	U.S.S.R.	4	497:43
Borman	U.S.	2	477:36
Savitskaya	U.S.S.R.	2	473:06
Kubasov	U.S.S.R.	3	449:59
Popovich	U.S.S.R.	2	448:29

TABLE 6-2a (cont.)

MISSION		PRIME CREW			BACKUP CREW	
Skylab	Commander	Pilot	Science Pilot	Commander	Pilot	Science Pilot
2	Conrad	Weitz	Kerwin	Schweickart	McCandless	Musgrave
3	Bean	Lousma	Garriott	Brand	Lind	Lenoir
4	Carr	Pogue	Gibson	Brand	Lind	Lenoir
Apollo-Soyuz	Commander	Command Module Pilot	Docking Module Pilot	Commander	Command Module Pilot	Docking Module Pilot
	Stafford	Brand	Slayton	Bean	Evans	Lousma
Shuttle c/	Commander	Pilot	Mission Specialists			
STS-1	Young	Crippen				
STS-2	Engle	Truly				
STS-3	Lousma	Fullerton				
STS-4	Mattingly	Hartsfield				
STS-5	Brand	Overmyer	Allen Lenoir			
STS-6	Weitz	Bobko	Musgrave			
STS-7	Crippen	Hauck	Fabian Ride Thagard			

TABLE 6-2a (cont.)

MISSION		PRIME CREW			BACKUP CREW
Shuttle	Commander	Pilot	Mission Specialists	Payload Specialist	Backup Payload Specialists
STS-8	Truly	Brandenstein	Bluford D. Gardner Thornton		
STS-9	Young	Shaw	Garriott Parker	Lichtenberg Merbold Ockels	
STS 41-B	Brand	Gibson	McCandless McNair Stewart		
STS 41-C	Crippen	Scobee	Hart Nelson van Hoften		
STS 41-D	Hartsfield	Coats	Hawley Mullane Resnik	C. Walker	R. Wood
STS 41-G	Crippen	McBride	Sullivan Ride Leestma	Scully-Power Garneau	Thirsk
STS 51-A	Hauck	D. Walker	Allen Fisher D. Gardner		
STS 51-C	Mattingly	Shriver	Buchli Onizuka	Payton	

TABLE 6-2a (cont.)

MISSION	PRIME CREW				BACKUP CREW
Shuttle	Commander	Pilot	Mission Specialists	Payload Specialist	Backup Payload Specialists
STS 51-D	Bobko	Williams	Griggs Hoffman Seddon	Garn C. Walker	R. Wood
STS 51-B	Overmyer	Gregory	Lind Thagard Thornton	Van den Berg Wang	Trinh Johnston
STS 51-G	Brandenstein	Creighton	Fabian Nagel Lucid	Baudry Al-Saud	Chretien Al-Basan

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a/ Not a spaceflight, but would have been the first manned Apollo mission. During testing on the launch pad 24 days before the scheduled launch, a fire erupted in the command module, killing all three of the prime crew astronauts.

b/ Mattingly was originally assigned to the prime crew but was exposed to measles several days before launch and therefore was replaced by his backup, Swigert, on the actual flight.

c/ In March 1982, NASA announced that it was discontinuing the practice of naming backup crews because there would be an adequate pool of trained astronauts ready to replace a prime crew member based on the large number of shuttle flights planned each year. Initially, NASA announced the first four shuttle crews as: Young and Crippen, Engle and Truly, Haise and Lousma, and Brand and Fullerton. Haise resigned before the flight. Engle and Truly were backups for STS-1, and Mattingly and Hartsfield were backups for STS-2 and STS-3. The exception to this rule includes payload specialists from other countries and from private firms.

TABLE 6-2b

U.S.S.R. MANNED SPACEFLIGHT CREW MEMBERS BY PROGRAM

MISSION	PRIME CREW			BACKUP CREW		
Vostok	Command Pilot	Pilot	Pilot	Command Pilot	Pilot	Pilot
1	Gagarin			Titov		
2	Titov			Nikolayev		
3	Nikolayev			Bykovski		
4	Popovich			Komarov		
5	Bykovskiy			Volynov		
6	Tereshkova			unknown		
Voskhod						
1	Komarov	Yegorov (P)	Feotistov (T)	Volynov	Lazarev	unknown
2	Bel'yayev	Leonov		unknown	Khrunov	
Soyuz						
1	Komarov			Gagarin		
3	Beregovoy			Shatalov		
4	Shatalov			Filipchenko		
5	Volynov	Khrunov (F)	Yeliseyev (T)	Shonin	Gorbatko	Kubasov
6	Shonin	Kubasov (F)		Nikolayev	Rukavashnikov?	
7	Filipchenko	Volkov (F)	Gorbatko (R)	Nikolayev	unknown	
8	Shatalov	Yeliseyev (T)		Nikolayev	Sevast'yanov?	
9	Nikolayev	Sevast'yanov (F)		Lazarev	Makarov	
10	Shatalov	Yeliseyev (F)	Rukavishnikov (T)	Dobrovolski	Volkov	Patseyev
11	Dobrovolsky	Volkov (F)	Patsayev (T)	unknown	unknown	unknown
12	Lazarev	Makarov (F)		Gubarev	Grechko	
13	Klimuk	Lebedev (F)		unknown	unknown	
14	Popovich	Artyukhin (F)		Volynov	Zholobov	
15	Sarafanov	Demin (F)		Volynov	Zholobov	
16	Filipchenko	Rukavishnikov (F)		Romanenko	Ivanchenkov	
17	Gubarev	Grechko (F)		Klimuk	Sevast'yanov	
April 5 Anomaly	Lazarev	Makarov (F)		Klimuk	Sevast'yanov	

TABLE 6-2b (cont.)

MISSION	PRIME CREW			BACKUP CREW		
Soyuz (cont.)	Command Pilot	Pilot	Pilot	Command Pilot	Pilot	Pilot
18	Klimuk	Sevast'yanov		Kovalenok	unknown	
19	Leonov	Kubasov (F)		Filipchenko	Rukavishnikov	
				Dzhanibekov	Andreyev	
				Romanenko	Ivanchenko	
21	Volynov	Zholobov (F)		Zudof	Rozhdestvenskiy	
22	Bykovsky	Aksenov (F)		Malyshev	Strekalov	
23	Zudov	Rozhdestvenskiy (F)		Gorhatko	Glaskov	
24	Gorbatko	Glazkov (F)		Berezova	unknown	
25	Kovalenok	Ryumin (F)		Romanenko	Ivanchenkov	
26	Romanenko	Grechko (F)		Kovalyonok	Ivanchenkov	
27	Dzhanibekov	Makarov (F)		Kovalyonok	Ivanchenkov	
28	Gubarev	Remek (CR)		Rukavishnikov	Pelczak	
29	Kovalenok	Ivanchenkov (F)		Lyakhov	Ryumin	
30	Klimuk	Hermaszewski (CR)		Kubasov	Jankowski	
31	Bykovskiy	Jahn (CR)		Gorbatko	Kollner	
32	Lyakhov	Ryumin (F)		Popov	Lebedev	
33	Rukavishnikov	Ivanov (CR)		Romanenko	Alexandrov	
35	Popov	Ryumin (F)		V. Titov	Stkeralov	
36	Kubasov	Farkas (CR)		Dzhanibekov	Magyari	
T-2	Malyshev	Aksenov (F)		Kizim	Makarov	
37	Gorbatko	Pham Tuan (CR)		Bykovski	Bui Thanh Liem	
38	Romanenko	Tamayo-Mendez (CR)		Khrunov	Lopez-Falcon	
T-3	Kizim	Makarov (F)	Strekalov (R)	Kovolyonok	unknown	Savinkyh
T-4	Kovalenok	Savinykh (F)		V. Titov	Strekalov	
39	Dzhanibekov	Gurragcha (CR)		Lyakhov	Ganzorig	
40	Popov	Prunariu (CR)		Romanenko	Dediu	
T-5	Berezovoy	Lebedev (F)		V. Titov	Strekalov	
T-6	Dzhanibekov	Ivanchenkov (F)	Chretien (CR)	Kizim	Soloviev	Baudry
T-7	Popov	Serebrov (F)	Savitskaya (CR)	Romanenko	Savinykh	unknown

TABLE 6-2b (cont.)

MISSION		PRIME CREW		BACKUP CREW		
Soyuz (cont.)	Command Pilot	Pilot	Pilot	Command Pilot	Pilot	Pilot
T-8	V. Titov	Strekalov (F)	Serebrov (R)	Lyakhov	Aleksandrov	unknown
T-9	Lyakhov	Aleksandrov (F)		V. Titov	Strekalov	
Abort	V. Titov	Strekalov (F)		Kizim	Solovyov	
T-10	Kizim	Solovyov (F)		unknown	unknown	unknown
T-11	Strekalov	Malyshev (F)	Sharma (CR)	Berezovoi	Grechko	Malhotra
T-12	Dzhanibekov	Savitskaya (CR)	Volk (R)	unknown	unknown	unknown
T-13	Dzhanibekov	Savinykh (F)				

FOOTNOTES FOR TABLE 6-2b

[a] Backup crews for Soviet space missions are rarely announced. In this table, backup personnel that are known for certain are listed, as well as a few of what could be described as "very good guesses." Those that fall into the conjecture category are designated with a "?".

[b] The second and/or third cosmonauts have not had uniform position titles. In this table, the following abbreviations are used: P = physiologist, T = technical scientist, R = research engineer, F = flight engineer, CR = cosmonaut researcher.

[c] It was announced that Zholobov had been a backup crew member for Salyut 3, although no distinction was made as to whether he was backup to Soyuz 14, 15, or both.

[d] The April 5 Anomaly, as it is called by the Russians, was aborted due to a third stage malfunction in the launch vehicle. Had the mission been successful, it would have been designated Soyuz 18. Instead, the next successful manned mission was given that designation.

[e] Soyuz 19 was the Russian part of the Apollo-Soyuz Test Project. Per an agreement with the United States, the Soviet Union provided two entire spacecraft, both with prime and backup crews, in the event that the first launch failed. Leonov and Kubasov were the prime crew for the prime spacecraft, with Filipchenko and Rukavishnikov as their backups. Dzhanibekov and Andreyev were the prime crew for the backup spacecraft, with Romanenko and Ivanchenkov as their backups.

[f] Lebedev was the prime crew member, but had to be replaced by Ryumin one month before launch because of a knee injury.

TABLE 6-3 (cont.)

Name	Country	Number of Flights	Total (hrs:mins)
Glazkov	U.S.S.R.	1	425:23
Artyukhin	U.S.S.R.	1	377:30
Strekalov	U.S.S.R.	2	355:26
Ride	U.S.	2	343:48
McDivitt	U.S.	2	338:57
Hauck	U.S.	2	337:09
Gardner	U.S.	2	336:54
Fabian	U.S.	2	316:03
Gordon	U.S.	2	315:53
Brandenstein	U.S.	2	314:48
Thagard	U.S.	2	314:27
Hartsfield	U.S.	2	314:07
Swigert	U.S.	2	313:59
Thornton	U.S.	2	313:12
Walker, C.	U.S.	2	312:53
Evans	U.S.	1	301:52
Schmitt	U.S.	1	301:52
Schirra	U.S.	3	295:13
Irwin	U.S.	1	295:12
Worden	U.S.	1	295:12
Overmyer	U.S.	2	290:17
Aldrin	U.S.	2	289:54
Aksenov	U.S.S.R.	2	284:15
Malyshev	U.S.S.R.	2	284:02
Volk	U.S.S.R.	1	283:14
Collins	U.S.	2	266:06
Duke	U.S.	1	265:51
Titov, V.	U.S.S.R.	2	263:17
Filipchenko	U.S.S.R.	2	261:05
Eisele	U.S.	1	260:09
Cunningham	U.S.	1	260:09
Shaw	U.S.	1	247:47
Merbold	U.S./ESA	1	247:47
Parker	U.S.	1	247:47
Schweickart	U.S.	1	241:01
Serebrov	U.S.S.R.	2	238:10
Shatalov	U.S.S.R.	3	237:59
Rukavishnikov	U.S.S.R.	3	237:11
Cooper	U.S.	2	225:15
Slayton	U.S.	1	217:28
Shepard	U.S.	2	216:17
Mitchell	U.S.	1	216:02
Roosa	U.S.	1	216:02
Yeliseyev	U.S.S.R.	3	214:25
Armstrong	U.S.	2	206:00
Truly	U.S.	2	199:22
Leestma	U.S.	1	197:24
McBride	U.S.	1	197:24
Garneau	U.S./Canada	1	197:24

TABLE 6-3 (cont.)

Name	Country	Number of Flights	Total (hrs:mins)
Scully-Power	U.S.	1	197:24
Sullivan	U.S.	1	197:24
Fullerton	U.S.	1	192:05
Fisher, A.	U.S.	1	191:45
Walker, D.	U.S.	1	191:45
Gibson, R.	U.S.	1	191:16
McCandless	U.S.	1	191:16
McNair	U.S.	1	191:16
Stewart	U.S.	1	191:16
Remek	U.S.S.R./Czech.	1	190:17
Hermaszewski	U.S.S.R./Poland	1	190:04
Chretien	U.S.S.R./France	1	189:51
Prunariu	U.S.S.R./Romania	1	189:41
Sharma	U.S.S.R./India	1	189:41
Jähn	U.S.S.R./E. Ger.	1	188:49
Farkas	U.S.S.R./Hungary	1	188:46
Tamayo-Mendez	U.S.S.R./Cuba	1	188:43
Pham Tuan	U.S.S.R./Vietnam	1	188:42
Gurragcha	U.S.S.R./Mongolia	1	186:43
Al-Saud	U.S./Saudi Arabia	1	169:39
Baudry	U.S./France	1	169:39
Creighton	U.S.	1	169:39
Nagel	U.S.	1	169:39
Lucid	U.S.	1	169:39
Leonov	U.S.S.R.	2	168:33
Gregory	U.S.	1	168:03
Lind	U.S.	1	168:03
Vandenberg	U.S.	1	168:03
Wang	U.S.	1	168:03
Griggs	U.S.	1	167:56
Hoffman	U.S.	1	167:56
Seddon	U.S.	1	167:56
Williams	U.S.	1	167:56
Garn	U.S.	1	167:56
Hart	U.S.	1	167:40
Nelson	U.S.	1	167:40
Scobee	U.S.	1	167:40
van Hoften	U.S.	1	167:40
Anders	U.S.	1	147:01
Bluford	U.S.	1	145:09
Coats	U.S.	1	144:57
Hawley	U.S.	1	144:57
Mullane	U.S.	1	144:57
Resnik	U.S.	1	144:57
Haise	U.S.	1	142:55
Allen	U.S.	1	122:14
Lenoir	U.S.	1	122:14
Musgrave	U.S.	1	120:24

TABLE 6-3 (cont.)

Name	Country	Number of Flights	Total (hrs:mins)
Peterson	U.S.	1	120:24
Shonin	U.S.S.R.	1	118:42
White	U.S.	1	97:56
Beregovoy	U.S.S.R.	1	94:51
Shriver	U.S.	1	73:33
Onizuka	U.S.	1	73:33
Buchli	U.S.	1	73:33
Tereshkova	U.S.S.R.	1	70:50
Crippen	U.S.	1	54:21
Engle	U.S.	1	54:13
Truly	U.S.	1	54:13
Komarov	U.S.S.R.	2	50:54
Demin	U.S.S.R.	1	48:12
Sarafanov	U.S.S.R.	1	48:12
Rozhdestvenskiy	U.S.S.R.	1	48:06
Zudov	U.S.S.R.	1	48:06
Khrunov	U.S.S.R.	1	47:49
Lazarev	U.S.S.R.	2	47:36
Ivanov	U.S.S.R./Bulgaria	1	47:01
Bel'yayev	U.S.S.R.	1	26:02
Yegorov	U.S.S.R.	1	24:17
Feoktistov	U.S.S.R.	1	24:17
Grissom	U.S.	2	5:09
Carpenter	U.S.	1	4:56
Glenn	U.S.	1	4:55
Gagarin	U.S.S.R.	1	1:48
SUBTOTAL 101*	U.S.	49	36,270:32
68*	U.S.S.R.	57	88,317:58
TOTAL 169	World	106	124,588:30

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* Includes all persons launched by the United States, regardless of nationality.

** Includes all persons launched by the Soviet Union, regardless of nationality.

TABLE 6-4
COMPARATIVE TIME SPENT ON EXTRAVEHICULAR ACTIVITY

Name	Country	Number of EVAs (Mission) Space	Number of EVAs (Mission) Lunar	Total* (hrs:mins)
Cernan	U.S.	1 (Gemini 9)	3 (Apollo 17)	24:11
Schmitt	U.S.	1 (Apollo 17)	3 (Apollo 17)	23:10
Kizim	U.S.S.R.	6 (Soyuz T-10)	0	22:50
Solovyov	U.S.S.R.	6 (Soyuz T-10)	0	22:50
Duke	U.S.	1 (Apollo 16)	3 (Apollo 16)	21:38
Young	U.S.	0	3 (Apollo 16)	20:14
Scott	U.S.	1 (Apollo 9)	4 (Apollo 15)**	20:09
Irwin	U.S.	1 (Apollo 15)	3 (Apollo 15)	19:13
Carr	U.S.	3 (Skylab 4)	0	15:51
Gibson	U.S.	3 (Skylab 4)	0	15:22
Garriott	U.S.	3 (Skylab 3)	0	13:42
Pogue	U.S.	2 (Skylab 4)	0	13:37
Conrad	U.S.	2 (Skylab 2)	2 (Apollo 12)	12:45
Stewart	U.S.	2 (STS-41-B)	0	11:30
McNair	U.S.	2 (STS 41-B)	0	11:30
Lousma	U.S.	2 (Skylab 3)	0	11:01
Allen	U.S.	2 (STS 51-A)	0	10:43
Gardner, D.	U.S.	2 (STS 51-A)	0	10:43
Van Hoften	U.S.	1 (STS 41-C)	0	10:30
Nelson	U.S.	1 (STS 41-C)	0	10:30
Bean	U.S.	1 (Skylab 3)	2 (Apollo 12)	10:27
Mitchell	U.S.	0	2 (Apollo 14)	9:23
Shepard	U.S.	0	2 (Apollo 14)	9:23
Aldrin	U.S.	3 (Gemini 12)	1 (Apollo 11)	8:18
Lyakhov	U.S.S.R.	2 (Soyuz 29 and T-9)	0	7:08
Aleksandrov	U.S.S.R.	1 (Soyuz T-9)	0	5:45
Musgrave	U.S.	1 (STS-6)	0	3:52
Peterson	U.S.	1 (STS-6)	0	3:52
Dzhanibekov	U.S.S.R.	1 (Soyuz T-12)	0	3:35
Savitskaya	U.S.S.R.	1 (Soyuz T-12)	0	3:35
Leestma	U.S.	1 (STS 41-G)	0	3:30
Sullivan	U.S.	1 (STS 41-G)	0	3:30
Kerwin	U.S.	1 (Skylab 2)	0	3:23
Griggs	U.S.	1 (STS 51-C)	0	3:00
Hoffman	U.S.	1 (STS 51-C)	0	3:00
Armstrong	U.S.	0	1 (Apollo 11)	2:48
Gordon	U.S.	2 (Gemini 11)	0	2:41
Berezovoy	U.S.S.R.	1 (Soyuz T-5)	0	2:33
Lebedev	U.S.S.R.	1 (Soyuz T-5)	0	2:33
Weitz	U.S.	2 (Skylab 2)	0	2:11
Ivanchenkov	U.S.S.R.	1 (Soyuz 29)	0	2:05
Kovalenok	U.S.S.R.	1 (Soyuz 29)	0	2:05
Grechko	U.S.S.R.	1 (Soyuz 26)	0	1:28
Collins	U.S.	2 (Gemini 10)	0	1:27
Mattingly	U.S.	1 (Apollo 16)	0	1:24
Ryumin	U.S.S.R.	1 (Soyuz 29)	0	1:23
Schweickart	U.S.	1 (Apollo 9)	0	1:07
Evans	U.S.	1 (Apollo 17)	0	1:06

TABLE 6-4 (cont.)

Name		Country	Number of EVAs (Mission)		Total*
			Space	Lunar	(hrs:mins)
Khrunov		U.S.S.R.	1 (Soyuz 4/5)	0	1:00
Yeliseyev		U.S.S.R.	1 (Soyuz 4/5)	0	1:00
Worden		U.S.	1 (Apollo 15)	0	:38
White		U.S.	1 (Gemini 4)	0	:36
Leonov		U.S.S.R.	1 (Voskhod 2)	0	:24
SUBTOTAL	36	U.S.	54	29	351:55
	16	U.S.S.R.	26	0	80:14
TOTAL	52		80	29	432:09

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*It is quite difficult to establish accurate figures for EVA (extravehicular activity) time. For Gemini, times were calculated from hatch opening to hatch closing; for Apollo and Skylab, times were based on cabin pressure equalling 3.0 psi. The times given here for Voskhod 2 and Soyuz 4/5 are thought to be equivalent to "hatch opening to hatch closing." Leonov reportedly spent 12 minutes outside the spacecraft, while Khrunov and Yeliseyev are thought to have spent 15 minutes transferring from Soyez 5 to Soyuz 4. On Soyuz 26, Grechko was reported by the Soviets to have spent 20 minutes outside the spacecraft, and 1 hour 28 minutes in the "near vacuum conditions of space" which is taken here to mean hatch opening to hatch closing.

** Scott performed a stand-up EVA from the lunar module during Apollo 15.

TABLE 6-5

MANNED SPACE FLIGHTS BY PROGRAM

Program	Number of Flights	Number of Persons	Person-Hours
Soyuz (U.S.S.R.)	49*	97	87,810:37**
Skylab (U.S.)	3	9	12,351:45
Apollo (U.S.)	11	33	7,506:03
Gemini (U.S.)	10	20	1,939:42
STS (U.S.)	18	83***	13,766:43***
Apollo-Soyuz (U.S.)	1	3	652:24
Vostok (U.S.S.R.)	6	6	382:26
Voskhod (U.S.S.R.)	2	5	124:55
Mercury (U.S.)	6	6	53:55
TOTAL	106	262	124,588:30
United States***			
1 person	6 times	6	
4 people	4 times	16	
4 people	3 times	12	
17 people	2 times	34	
75 people	1 time	75	
TOTAL 101 individuals	49 flights	143	36,270:32
Soviet Union**			
2 person	4 times	8	
10 people	3 times	30	
22 people	2 times	44	
37 people	1 time	37	
TOTAL 68 individuals	57 flights	119	88,317:58

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* Includes all manned flights of Soyuz and Soyuz-T.

** Includes all individuals launched by the Soviet Union, regardless of nationality.

*** Includes all individuals launched by the United States, regardless of nationality.

TABLE 6-6

DECEASED ASTRONAUTS AND COSMONAUTS*

Name/Country	Program	Date	Cause of Death
Adams/U.S.	MOL; X-15	11/15/67	X-15 crash.
Bassett/U.S.	NASA	02/28/66	Jet crash.
Belyayev/U.S.S.R.		01/10/70	Complications from surgery.
Chaffee/U.S.	NASA	01/27/67	Apollo 204 fire.
Dobrovolskiy/U.S.S.R.		06/29/71	Soyuz 11 reentry.
Freeman/U.S.	NASA	10/31/64	Jet crash.
Gagarin/U.S.S.R.		03/27/68	Jet crash.
Givens/U.S.	NASA	06/06/67	Automobile accident.
Grissom/U.S.	NASA	01/27/67	Apollo 204 fire.
Komarov/U.S.S.R.		04/24/67	Soyuz 1 crash.
Lawrence/U.S.	MOL	12/08/67	Jet crash.
McKay/U.S.	X-15	04/27/75	Complications from 1962 X-15 crash; after leaving program.
Patsayev/U.S.S.R.		06/29/71	Soyuz 11 reentry.
Rogers/U.S.	X-20	09/13/67	F-105 explosion; after leaving program.
See/U.S.	NASA	02/28/66	Jet crash.
Swigert/U.S.	NASA	12/27/82	Cancer; after leaving program.
Taylor/U.S.	MOL	09/04/70	Jet crash; after leaving program.
Volkov/U.S.S.R.		06/29/71	Soyuz 11 reentry.
Walker/U.S.	X-15	06/08/66	Jet crash.
White/U.S.	NASA	01/27/67	Apollo 204 fire.
Williams/U.S.	NASA	10/05/67	Jet crash.

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* The list of deceased cosmonauts is believed to be incomplete. It includes all publicly announced deaths, but a highly placed Russian space official indicated privately to his American counterpart in April 1974 that eight Soviet cosmonauts in training have been killed in aircraft or automobile accidents since 1960, before having had any opportunity to fly in space.